ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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Hand Grenades.

The old adage that "An ounce of prevention is worth a pound of cure" is nowhere more noticeable than in the matter of hand grenades. Their timely use has often saved life and property. No shop or factory is properly equipped without them, and fortunately they are easily and inexpensively made. Many liquid compounds have been devised to use for the above named purpose; many of them are worthless and some of them are good. A few of them have been sold commercially, and for them it has been claimed by their manufacturers, that their particular make was "sure cure" and all others worthless. Be that as it may, several good compounds are well known to chemists. Here is one of them that has often demonstrated its ability to throttle the fire fiend:

1 part by weight of green vitriol (ferrous sulphate).
4 parts by weight of sulphate of ammonium.
25 parts by weight of water.

As the green vitriol rapidly oxidizes into ferric sulphate when its aqueous solution is exposed to the air, the mixture must be bottled as soon as it is made. No fire extinguishing mixture possesses a mysterious potency of its own. None of them are of much use unless considerable quantities are used. Hence use large bottles (at least a quart each) made of thin glass, that they may be sure to break when thrown. Make up a quantity of the above mixture (it costs but little) bottle it at once and hang the bottles in conspicuous places plainly marked as to their use. If you wish to demonstrate the value of the above mixture, thoroughly saturate a piece of cotton or other inflammable cloth in it, and when dry, try and set it on fire.

A hand grenade acts in three ways: First, by the water it contains (a few quarts of water, rightly placed, at the right moment, will save a deal of trouble); second, by coating inflammable substances, against which it is thrown, with a non-combustible covering; third, by generating gases, when thrown into the fire, which will not support combustion.

The following mixture meets all three of these requirements, and although a litlte complicated to make, will repay one for his trouble.

9	pounds	common alum.
10	"	" salt.
2	"	Glauber's salt.
2	"	carbonate of soda.
3	"	water glass.

This is best made by mixing the chemicals together dry, and then dissolving the whole in water; bottle at once as before.

The Lighting of Bowdoin College.

To the Editor of Electrical Review:

I noticed in a recent number of your paper a communication on electric lighting at this college. "A Student" evidently forgets the fact that a year and a half ago an Edison machine was set up in the laboratory workshop, and used for experimental purposes and for lighting the laboratories. At the beginning of the present school year wires were run to the new gymnasium, and since then that building also has been regularly lighted from the same source.

The entire work of setting up the engine and dynamo, wiring the buildings and running the plant has been done by the students with the assistance of some of the instructors. Our idea being, as far as possible, to combine practice with theory in our teaching.

WILLIAM H. COTHREN.

Bowdoin College, Brunswick, Me., Feb. 19.

The Alternating System of the Westinghouse Electric Company.

There is more interest taken in the new induction system, which is being introduced by the Westinghouse Electric Company, of Pittsburgh and New York, than in any one branch of electric lighting. The company has, with wonderful dispatch and enterprise, constructed a number of stations, where this new system can be seen in operation, notably at Pittsburgh, Pa.; Greensburgh, Pa.; Carbondale, Pa.; Plainfield, N. J.; Buffalo, N. Y.; and a small one at Torrington, Conn. The plant at Plainfield, which was built by Mr. A. P. Wright, has been running ever since the opening night, about six weeks ago, and not a single change or stoppage has been made, and the plant is now being increased. The fuller details of the induction system as exploited by the Westinghouse Company will appear later; in this issue we present a view of the company's new dynamo and the distributor, the latter showing the method of making the connections on the pole.

The Westinghouse Company expect to make incandescent lighting from central stations universally economical and profitable irrespective of distance, and have certainly given abundant evidence of their faith in their possessions, and there is connected with the company a very capable and enterprising staff of electrical workers.

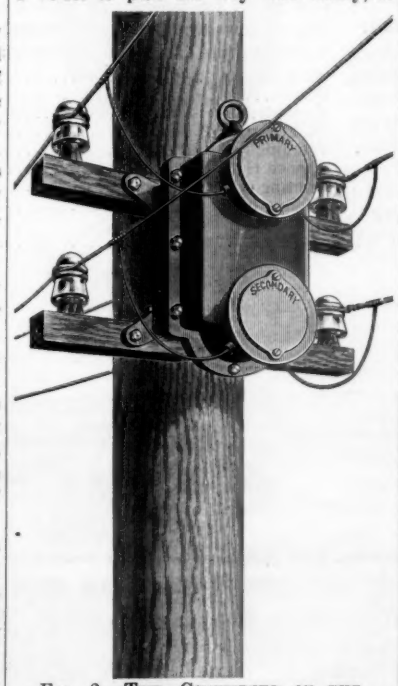


FIG. 2.—THE CONVERTER OF THE WESTINGHOUSE ELECTRIC CO.

FIG. 1.—NEW DYNAMO OF WESTINGHOUSE ELECTRIC CO.

Electric Headlight for Ships.

The navigation of the Suez Canal at night by aid of the electric light demonstrates that this method of illumination, says London *Engineering*, might be advantageously applied in other situations where, hitherto, vessels have not dared to move after dark. In other straits and channels, where the traffic is not sufficiently large to pay for the proper lighting and buoying of the banks and coast, an electric headlight would enable a vessel to pick her way with safety, all objects for a thousand yards before her being made distinctly visible. An electric plant designed for this purpose was exhibited recently at the works of Mr. Peter Brotherhood. It consists of a three cylinder engine and a Victoria Brush dynamo built on one bed-plate, and an automatic arc lamp of very simple and strong construction fixed in a projection fitted with a parabolic reflector and a horizontal dispersion lens. The beam from a current of 30 amperes is spread out into a band, which widens as it goes, until at a distance of 1,000 yards, it stretches over a width of 300 feet. The lantern can be tilted or turned from side to side as desired, and if it be desired to minutely examine any object in the distance the dispersion lens can be turned aside, and the condensed conical ray from the parabolic reflector be directed on to it. The plant has been designed to occupy as little space as possible, the engine and dynamo only measuring 4 ft. 7½ in. by 1 ft. 9½ in. by 1 ft. 9 in., and can be placed in unskilled hands.

Electric Heater.

To the Editor of Electrical Review:

I have just read in your worthy paper of the January 8th issue, an article headed "A New Electric Heater," in which is explained a new process designed to heat by electric currents steam railway cars. Allow me to inform you that I was the first to have the idea of applying the heat developed in an electric circuit of high resistance to the warming of railway cars, as you can prove by the following passage, which I quote from the *Moniteur Indus riel*, Dec. 25, 1884:

"At the same time that Dr. Donato Tommasi was engaged in the accomplishment of railway car lighting by electricity and gas combined, he discovered the means of extending the application of electricity to the heating of the same cars.

"In the arrangement proposed by Dr. D. Tommasi,* a dynamo driven by the axle of the car sends current through a circuit which runs the length of the train and under which are attached the conductors which connect with each footstove, the current passing through spirals in this placed lengthwise. The footstoves are previously filled with a substance—a high latent heat of fusion as crystallized acetate of sodium, hyposulphite of sodium, etc.

"Before the departure of the train the footstoves are immersed in boiling water, then placed on the train and connected with the circuit. While the train does not move no special effect is produced, but as soon as it acquires sufficient speed the current passes through the footstoves. Now, as the conductors in the stove have a less cross section than the main conductors, they become heated in proportion to their resistance, and the heat so produced compensates for the heat radiated to the body alone or to the material employed; that is the heat which is lost by radiation, and which serves to heat the car.

"The footstoves can be used for three hours at least; no stop of less duration would produce any lowering of temperature that it would be necessary to replace them.

"It follows that a train could go from Calais to Brindisi, or from the frontier of Spain to the frontier of Russia, or to run back and forth between two points without there being any necessity of changing the footstoves.

"It can be seen that there would be great

* This invention dates back more than two years, as is shown by a patent recorded in due form.

advantages for the companies and for travelers; reduction of the number of footstoves in use, of installations, of attendants and of repairs, the doing away of the trouble of refilling, so disagreeable, and, above all, so annoying to travelers, especially during the night.

"M. D. Tommasi has invented also a device which cuts out of the circuit every footstove which becomes heated to such a temperature as to be a source of danger and which puts it in circuit again as soon as the temperature has become normal.

"It will be noticed further that the system is adapted to changes of rolling stock between the lines on which it is adopted, as it admits of long stops, that is to say, delays equal to the return for the heat lost."

In asking you, Mr. Editor, to publish the above extract in your worthy paper, I beg you to accept the assurance of my best wishes. D. TOMMASI.

PARIS, Feb. 18, 1887.

The Horse Power of a Whale's Tail.

Sir William Turner, the eminent Professor of Anatomy in the University of Edinburgh, recently delivered a lecture to the members of the Philosophical Institution of that city on "Whales: their Structure and Habits," in the course of which he referred to a point of considerable interest to engineers, which was the horse power exerted by the tail of a large whale. Regarding the length of full-grown whales, Professor Turner remarked that the porpoise was 4 feet or 5 feet long, whereas the Greenland right whale was from 50 feet to 60 feet long, and he said that the great finner-whale, which frequently visited the British seas, reached the length of 80 feet or even more. An animal of the latter sort was stranded at Longniddry some years ago. After speaking at some length on the structure of whales, the lecturer made some remarks on the rate of speed at which they traveled. It had been estimated, he said, that the Greenland whale could attain a speed of nine or ten miles an hour, and that the finner-whales attained even a greater speed. In all probability the Longniddry whale could propel itself through the water at the rate of twelve miles an hour, and the sperm whale was said to be capable of driving itself along at the same rate of speed. He had asked Mr. John Henderson, of Glasgow, the well-known builder of the Anchor liners, to assist him in arriving at the horse power which must be exercised by one of these great whales so as to acquire a speed of twelve miles an hour, and he put the case of the Longniddry whale before him. It was 80 feet long, weighed about 74 tons, and had a tail 18 feet to 20 feet across from the extreme ends of its flanges. With these data Mr. Henderson calculated that a whale of the dimensions mentioned, in order to attain a speed of twelve miles an hour, would require to exercise a propelling force of 145 horse power.

—— The sub-commission appointed to consider the question of lighting the International Exhibition to be held at Paris in 1889 has reported favorably upon a project submitted by M. Georges Berger, which involves the employment of every known means of illumination. The total amount of light to be furnished is estimated at 2,850,000 standard candles, which is said to be upwards of five times the intensity produced by the whole of the gas lamps in Paris.

The Electric Light at Notre Dame.

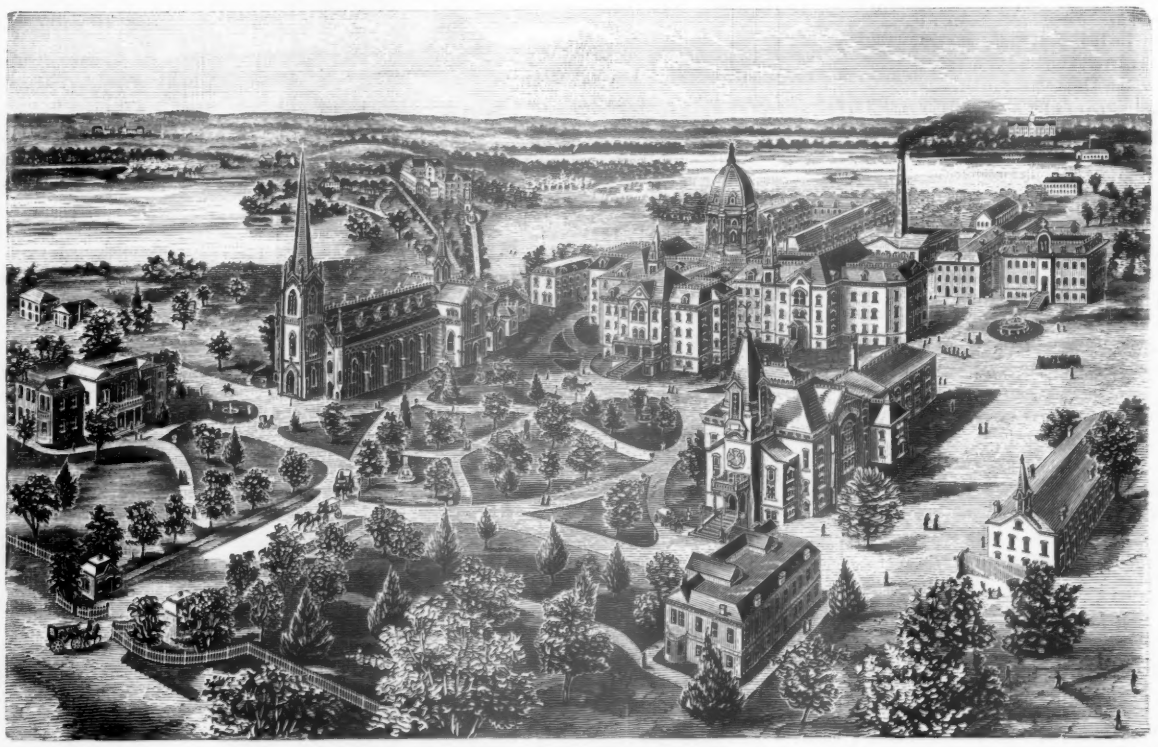
To the Editor of Electrical Review:

In the communication to the REVIEW of the 12th instant from a student of Bowdoin College, the assertion that "Bowdoin will be the first college in America to be lighted by electricity" probably escaped your notice. The following facts may be interesting to "Student" and your readers generally.

The arc light has been in use at Notre Dame for the past six years, and is still giving perfect satisfaction for illuminating the recreation grounds of the various departments.

In 1885 President Walsh introduced the Edison incandescent light. 110 ten candle power lamps were distributed in the Senior and Junior study halls; replacing Argand gas jets. The satisfaction expressed by both faculty and students, determined the Rev. President to give an immediate order for a larger plant, with 16 candle power lamps, to replace the gas in the class, society and private rooms throughout the main building. The work was continued, and the lamps now in daily use are distributed as follows:

Main building	300
Dome	39
Presbytery	25
St. Edward's Hall	67
Washington Hall	80
Science Hall	90
Printing office	36
Engine, boiler and bath house	15
Total	690



NOTRE DAME UNIVERSITY LIGHTED BY ELECTRICITY

The 40 dome lights are arranged to form a crown above the head, and a crescent at the feet of a large bronze statue of Notre Dame, surmounting the dome 200 feet from the ground. This feature was designed and carried into execution, with Maxim lamps, by Rev. J. A. Zahm, Professor of Physics, in 1884.

Two Armington & Sims high speed engines furnish power for two Edison incandescent and one VanDepoele arc dynamo. On account of the large boiler capacity required for heating and domestic purposes, the addition of the engines causes no appreciable extra cost for fuel. The exhaust from the larger engine is used for low pressure heating.

The light has been the subject of universal admiration to visitors, and of general satisfaction to all connected with the college; the name Edison system is now "found in their mouths as household words."

Since the plant was accepted by the college authorities all additions and changes have been made without difficulty; but thanks are due to Messrs. Leonard and Pierce, of the Western Edison Company, and to Mr. C. C. Haskins, of the ELECTRICAL REVIEW, for valuable suggestions and direction. For ordinary testing and regulation a Wirt voltmeter, Wheatstone bridge and sixteen cells chloride of silver battery are used. Other instruments are procured from the laboratory of Science Hall when special accuracy is desired. Tampering or experimenting with the regular lighting circuits is not permitted. The lamps used are 95 volt, 16 candle power with a few 10s and 32s for entrances, etc. In one building, 1,000 feet from the dynamo, connected by a rather small wire, originally intended for another purpose, lower volt lamps are supplied to allow for the "drop." The orderly routine enforced at the college at all times, will allow the number of lamps to be more than double the dynamo capacity.

M. O'DEA.

Notre Dame, Ind., Feb. 21, 1887.

[A view of the Notre Dame University is given in this edition of the REVIEW.—ED.]

Incandescent Lamp Manufacture.

BY J. SWINBURNE.

CARBONIZING.

Carbonizing is simply raising the prepared material to a high temperature out of contact with the air. The prepared threads or blanks are placed in a closed vessel in a suitable furnace, and raised to a red or a white heat. The kind of furnace used depends on the temperature desired. The action of heat on such a substance as amyloid is, first to decompose it and char it, driving off the volatile portions, and to leave a residue of conducting charcoal. Second, if the charcoal is carried to a very high temperature it becomes very much harder and more conducting, and seems to be converted into a modification possessing some of the properties of graphite.

If the material is merely converted into charcoal it is softer and therefore more carbons are lost in handling, and it occludes gases and moisture and the carbons are apt to fly to pieces on being "flashed." It is therefore very much better from that point of view to use a furnace that can give a white heat. But, on the other hand, the carbons can be very highly heated during flashing, and furnaces that give very high temperatures are more expensive to begin with, and cost more in fuel and in crucibles.

The effect of a very high temperature on carbon may easily be shown by comparing carbons that have been very highly heated with others that have merely been converted into conducting charcoal. If one of the latter is held in a gas flame it will glow and burn away at once. If one now be put in a vessel which is exhausted, or filled with coal gas at a very low pressure, and then raised by a current to a very white heat for a moment, it will be found quite altered. It will be quite hard and springy, and will have a steel-like ring. Its electrical resistance will be very much reduced, and it will no longer burn in the gas flame. It has also lost its power of occluding gases. The hardening and decrease of resistance when carbons are flashed have generally been supposed to be due to the deposition of carbon, and this is partly true; but the greater part of the effect is due to the high temperature. The resistance falls suddenly immediately the carbon is highly heated, and it goes on falling slowly owing to the deposition of carbon from the surrounding gas. The electrical resistance of carbon may be reduced even by maintaining a red heat for a long time. A carbon kept at a red heat will go on falling in resistance for some weeks.

The kind of furnace employed depends on the size of the factory. For a large one a reverberatory furnace, such as is used in iron works, is very satisfactory. A reverberatory furnace can be easily regulated to give any temperature up to the melting point of iron.

For smaller outputs a coke or gas furnace is better.

Coke furnaces, built up of pieces of fireclay, with iron binding to prevent their falling to pieces when cracked, can be got up to very large sizes. What are erroneously called reverberatory furnaces do very well. They are tumbler-shaped, with round tops with necks for sheet-iron chimneys. They are made in three pieces. This kind of furnace will easily melt a file, and requires very little attention. On the other hand it takes a round, or, more correctly, a cylindrical crucible, and it is not easy to pack carbons into such a shape closely. A large furnace is therefore necessary for a given output.

Gas furnaces are very much more convenient. Fletcher's reverberatory furnaces are very good. No doubt other gas furnaces are as good, but with Fletcher's gas apparatus results as good as or better than those given in the catalogue are always to be obtained. These reverberatory furnaces can be used either with a chimney draught or with a blast. The burners of the draught reverberatory furnaces give trouble if they are not carefully adjusted. Not the least advantage of gas is its cleanliness. Such a furnace as that described need not have a room to itself, but can be placed on an iron topped table in the thread room, and looked after by girls.

If the material is in the form of thread, such as squirted amyloid, it is wound on a rectangular frame made of two rods and two end pieces. The end pieces are flat slips with a hole in each end the size of the rods, so as to hold the rods stiffly. The thread is wound over the rods. The rods are earthenware, or preferably arc light carbons, as most kinds of earthenware crack. The side pieces must be made of some material that contracts when carbonized, otherwise the carbons would break, as they contract considerably. On the other hand, the side pieces must not contract too much, or the carbons will not be kept taut and will

come out irregular in shape. For amyloid carbons, soft wood, such as deal, is about right. The deal should be cut with the grain of the wood lengthwise, for if it is cross-grained it will contract too much.

If the carbons are to have single loops, as generally used in low-resistance lamps, the frames may be so arranged that each turn makes two carbons, a little extra length being allowed for waste, and a large margin for contraction. It is generally better, however, to make the frames shorter, so that each turn makes one carbon. The carbons are then more likely to be well shaped. The thread is wound evenly on the frame by a traversing screw arrangement. Long, thin carbons cannot always be made in single hairpin loops, as they are then too long to go into a small lamp. Swan's well-known loop makes a very pretty lamp. It is got by giving the thread an extra turn round the rod of the frame. It is somewhat difficult to wind thread on frames so as to give this form. It can be done by hand by winding enough thread on a small reel to fill one frame, and passing it through every second turn. This does very well for experimental work, but it is too tedious for factory use. The thread can be wound on the frame by a suitable machine, and more or less complicated winders are in use. The rods are gripped by one end in a clamp, and one wooden end piece is pressed up against the clamp, so that the frame is like a two-pronged fork. The thread is wound by rotating the frame and a reel of thread, so as to give the desired motion by means of an ingenious application of the Geneva stop. The writer has devised a cheaper winder. The thread is wound on a reel with a nozzle, through which it is unwound. The reel and nozzle are so mounted that the nozzle turns round a center, so that if one rod of a frame were there a continuous spiral would be wound on it. A screw feed moves the nozzle and reel along. Instead of remaining stationary the frame is turned on its own center at only half the speed of the nozzle, so that two turns are wound on each rod alternately. A similar result can be obtained with a stationary reel and nozzle, and a modified sun and planet attachment carrying the frame. When the frame is nearly filled the thread is fastened, and the wooden end piece pressed on before the clamp is unscrewed.

For long thin carbons the rods may be made of large diameter. A very pretty shape is obtained by winding the loop over two rods instead of one, so that it is long. This shape fits a long-shaped bulb best, while the Swan loop suits the round or nearly round form.

When the frames are wound they are wrapped in paper and placed in the crucible. Powdered charcoal mixed with lampblack is shaken down so as to fill up the interstices and cover the frames completely. The lid is then cemented down with fire-clay. The object of the paper is to keep the carbon dust off the thread, as it is otherwise necessary to dust the carbons after carbonizing, and all such processes as that, though they seem nothing on paper, absorb time and cost money, and lead to breakage and waste of carbons. If a high-temperature furnace is used the crucible must be made of fire-clay or graphite. Morgan's are very good. They can be made in any reasonable form in three weeks or a month. For low temperatures cast-iron boxes are best.

The charcoal and lampblack are to prevent access of oxygen to the carbons. It is doubtful whether the lampblack is really necessary, and it is very dirty. New lampblack is often troublesome in another way; it is a very bad conductor of heat, and either prevents the crucible from cooling or takes fire at a very low temperature. The writer has seen fire-clay crucibles, 14 inches by 10 inches, which became red hot inside when opened after being removed from the furnace two days. Powdered charcoal alone is generally used. When charcoal or lampblack is heated very strongly over and over again it shrinks and hardens, and being less combustible at low temperatures, is no longer such perfect protection. The paper wrapped round the frames and the wooden end pieces are, however, sufficient, as they give off gases which make it impossible for the carbons themselves to be at all attacked by oxygen.

The final temperature reached by the furnace is not alone to be considered, the rate of heating is also very important. If the crucibles are heated rapidly the outsides become hot first, as the powdered charcoal is a very bad conductor of heat. The wooden end pieces of the frames are thus carbonized before the thread, and the result is that the rods are brought closer together before the thread begins to shrink. It is thus loosened, and shifts about on the frames, and it then contracts and breaks here and there, or finally comes out as very irregular carbons. Mr. A. Woodley, who was the writer's assistant and successor at the Swan Lamp Works in Boston, U.S.A., finally carbonized by heating the saggars or crucibles in the furnaces used for the manufacture of arc carbons. These furnaces were designed by Mr. Brush to admit of the most accurate regulation of the temperature throughout the firing. As Mr. Brush's furnaces—and, in fact, the whole of his processes of manufacture of arc light carbons—are kept secret, the writer will not publish any description. Mr. Woodley found carbons made by extending the rise of temperature over several days were very much more regular in shape, and more uniform in resistance, than those made in a day.

Carbons made from amyloid sheets by punches, or from paper or other sheets, are carbonized by placing them in layers with a suitable material between. The material should have the same contraction as the blanks, and should not wrinkle up. Paper is generally unsatisfactory, as it wrinkles. Calico is about the best material; some calicoes, probably those which are sized, are troublesome, but are better after washing in water and drying flat. The blanks are punched with the ends joined together for support, as a flat horseshoe of such flimsy material would be very difficult to carbonize well if the ends were loose. It is not necessary to add powdered charcoal or lampblack to crucibles which are nearly filled with calico, as it thoroughly protects the carbons if the crucible lids are properly luted. A flat weight should rest on the calico, so as to keep it pressed out flat during carbonization.

Silk gives great trouble in carbonizing. It not only contracts very much, but it has to be heated at a particular rate. The carbon and wood frames, already described, are not suitable for silk thread, as it needs support along its length, or else it breaks or comes out crooked and uneven. Blocks of retort carbon, with one side or two opposite sides rounded, are used. The thread is wound on these in one layer, with about a sixteenth of an inch clearance between neighboring turns. When a block is filled, soft cotton thread, such as fine knitting cotton, is wound over the block at right angles to the silk. This is wound tight enough to keep the silk straight, but not tight enough to prevent its shrinking lengthwise. After the cotton is wound on, the silk is cut by drawing a knife along the block, so that it becomes a number of loops tied gently over a carbon block. The blocks are then wrapped in paper and placed in the crucibles, with powdered charcoal over them.

The crucibles are then transferred to a gas oven, heated to a temperature at which paper begins to char, and are kept there for three or four hours. They are then put in the furnace and raised to a high temperature. The successful carbonization of silk threads requires great patience and considerable practice. Fine threads are very apt to be drawn flat or weakened at the arch. Thick carbons for low resistance lamps give no trouble.

The blocks or frames should nearly fill the crucible, so that they cannot fall about and damage the delicate carbons. Pieces of millboard about the same size as the frames may be put against them before wrapping the frames in paper. This prevents anything coming in contact with the carbons during the carbonization.

The furnace may be cooled at any rate, as that does not affect the carbons. Slowness of heating secures good and regular shapes, and high temperature, or long-continued firing, makes the carbons hard and durable, and of low specific resistance.

After unpacking, the carbons should be carefully dusted, if at all dusty, as small particles of charcoal power may otherwise adhere, and these will cause irregularities in flashing, as the carbon is deposited more thickly on excrescences.

Blacklead should not be used as a substitute for powdered charcoal, as it does not protect the carbons, for graphite only combines with oxygen at a high temperature.—*London Electrician.*

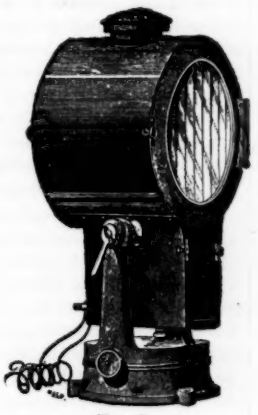


FIG. 2.

FOCUSING LANTERN.

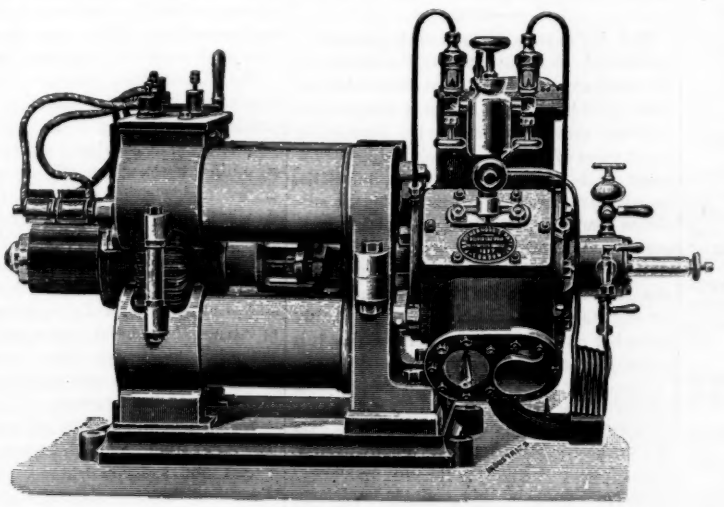


FIG. 1.—VICTORIA DYNAMO AND BROTHERHOOD ENGINE OF THE BRUSH CORPORATION

* * An electric locomotive has been introduced in England, which is similar in appearance to a short tramcar, and carries a secondary battery of fifty cells. This battery is connected up with the electric motor, the motion shaft of which projects horizontally about two feet, and carries at the end a spur wheel which gears into a fixed circular rack The machinery is so arranged that a speed of eight miles an hour cannot be exceeded, and the battery once charged will work for six hours.

Portable Electric Search Light.

We illustrate herewith, in Fig. 1, a compact and neat electric lighting plant, intended for use on board ship, to facilitate the navigation of canals and other narrow water ways at night, and consisting of a three-cylinder Brotherhood engine, combined with a Victoria dynamo, made by the Brush Corporation. The dynamo differs from the usual type of machine made by this company, in having single horseshoe magnets instead of the ordinary form of double horseshoe magnets with exciting coils on either side of the pole pieces. The present arrangement was chosen mainly with a view to economize space. The armature is of the usual disk pattern, revolving between four poles which form the extremities of four wrought-iron magnet cores, bolted to a common yoke in the usual way. The dynamo is speeded at 750 revolutions per minute, and is capable of developing 65 volts at the terminals, with a current of 40 to 60 amperes. The field magnets are compound wound, whilst the engine, as mentioned above, is of the Brotherhood type, with cylinder 3 inches diameter by 4 inches stroke, and is constructed for 90 lbs. steam pressure One of the bearings is projected between the magnets of the dynamo, so as to form a bearing for the dynamo shaft. The two shafts are, in fact, continuous, the armature being overhung, and having no outside bearing. The weight of the complete plant, consisting of engine, bed plate, and dynamo, is 7 cwt., and the extreme dimensions are—length, 2 feet 10 inches; width, 1 foot 8½ inches; height, 1 foot 10¼ inches. The small weight and compact arrangement render it easy to ship the plant at the entrance of a canal, and unship it when the end is reached. Similar plants, also with Brotherhood engines, but with dynamos and lamps supplied by Sautter Lemonnier, are already in use, for the navigation of the Suez Canal, the canal company having permitted navigation at night to vessels which take the apparatus on board. The saving of time thus effected is about twelve hours. The lamp to be used with this dynamo is of the new Victoria automatic focusing type, recently introduced by the Brush Corporation. The large search lights in use in our and other navies are generally hand fed, that is to say, an attendant works the feed mechanism and approaches the carbons according to his own judgment, when looking through a small aperture fitted at the back of the lantern, and observing the arc through a colored glass. When the current employed is 150 amperes or more, the service is of sufficient importance to justify the employment of a man for this purpose, and it seems that those who have to use the light prefer the control by hand to automatic feed regulation; but for small search lights the adoption of automatic feeding and focusing is a decided improvement, as it dispenses with the tedious work of watching the arc, and allows the man in charge of the light to devote his whole attention to handling the lantern, and directing the beam of light to the best possible advantage. The present lamp is provided with a Chance mirror, 10 inches diameter, and, in place of the usual door or front of plain glass, a compound dispersing lens can be inserted, which converts the parallel beam into a wedge of light of small vertical dimension, but spreading out horizontally like a fan. This flattens the beam, and distributes the light in an economical manner over the area which it is desired to illuminate. There is also the further advantage that the observer can look directly over or under the beam without having his sight dazzled in an atmosphere where the scattering of light by particles of water is apt to somewhat dim the vision. The lantern, which weighs complete 2 cwt., is capable of vertical and horizontal adjustment, and is shown in Fig. 2.

* * A meeting of the citizens of South St. Louis was held to consider the rapid transit question. James A. Meegan presided. Dr. Wellington Adams addressed the meeting at some length. Resolutions were finally adopted urging on the Council the advantages of the Adams Electric Elevated Railroad bill.

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EDITORIAL ANNOUNCEMENT.

Address all communications and make all Express Money orders, P. O. orders and checks, payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Frank M. Gilley, 54 Equitable Building, Boston, Mass., is our New England representative.

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill., will represent the REVIEW in the West.

Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, MARCH 19, 1887.

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The Senate bill to fix telephone rentals in New York and Brooklyn at $6.50 a month, $4.00 in Buffalo, and $3 in the rest of the State, has been reported favorably. It is not likely that such an arbitrary and foolish bill will become a law.

Underground matters, electrically speaking, seem somnolent.

Mr. Charles Kintner, principal examiner in the electrical class at the Patent Office, has tendered his resignation, to take effect April 1st, and in future will be associated with an old patent soliciting firm in Philadelphia. Mr. Kintner made an enviable reputation for himself in the discharge of his official duties, and with his ability and experience he will undoubtedly take high rank among patent attorneys, particularly in the electrical branch of the profession.

The suit in Boston by the Government against the Bell Telephone Company was commenced last Monday, but was adjourned to await the decision of Judge Colt in the matter of granting the defense the right to demur and plead at the same session. The counsel for the Government were ex-Solicitor-Gen. John Goode, William C. Trowbridge, of Philadelphia, and Jeff Chandler, of Washington; for the Telephone Company, J. J. Storrow and Chauncey Smith.

Electrical engineering has not yet been organized as a distinct course at the Notre Dame (Ind.) University, but special opportunities are given to students who desire to give their attention to modern practical electricity. Besides the usual frictional apparatus, several medium-sized dynamos, including Edison and Maxim types, small motors, standard instruments, batteries, etc., are always available. It is very probable that a full course in electrical engineering will be announced in the early future.

The legislative investigating committee discovered in Brooklyn that the telephone company and fire department were using the same poles in all cases where it was possible—a very sensible arrangement, saving the duplication of poles and diminishing the expense to both parties. In some cities the fire department depends entirely on the telephone company for its alarms, notably Kansas City, Mo., where the service is satisfactory to the fire department and is furnished at a great saving to the city. Instead of objecting to the Brooklyn arrangement, we think her citizens will be convinced that it is a wise and economical plan.

Platinum is much more largely used in the various branches of electrical work than ever in the past. We are informed by Messrs. Baker & Co., of Newark, the only refiners of crude platinum in this country, and large importers and melters, that their orders for the first two months of this year have increased over fifty per cent. This demand comes from manufacturers of electrical instruments where platinum is used for contacts, and from parent electric light companies, electricians, chemical houses, jewelers and dentists. It is a highly important and interesting fact connected with the manufacture of incandescent lamps that the coefficients of expansion of platinum and glass are the same, and the metal now enters into the construction of all incandescent lamps.

The Bell Telephone Company's officials say that a great deal of unnecessary importance has been attached (through misleading reports sent from Ottawa) to the last decision of the Minister of Agriculture, voiding the Blake transmitter patent. This was not an original patent for a transmitter, but only for an improvement on its method of construction, and is only one of the numerous patents held by the company on this class of instruments; and the setting aside of this does not by any means allow the public to manufacture or use Blake transmitters, and will make no difference whatever to the company. The decision was given on evidence put in two years ago, and was anticipated by the company, which did not contest the case at all. In the case of the Edison patents, after all the evidence for the petitioners had been heard, the Bell Company's counsel moved to have the case dismissed without the necessity of bringing forward evidence for the defense on the ground of absence of proof. The Minister stated that he would consider this and announce his decision on this point in a few days.

LET THE PUBLIC INVESTIGATE BEFORE CRITICISING.

We have been told by the highest authority that to err is human, and those of us at all observant have discovered that hasty judgment is another human failing to which poor humanity is heir. A lineman is killed while serving an arc circuit, and uninformed people jump to the conclusion that electric lighting threatens the life of the community. The editor of the local paper in the section where the accident took place preaches an editorial sermon upon the danger of using electricity for lighting. He says that at any moment forked lightning may jump from the wires upon the heads of the people, that to lead a powerful electrical current through the streets is to take death by the hand and invite him to slay untrammeled. He waxes warm and eloquent upon the theme. Starting with an absurd and altogether unsustained premise, he draws conclusions which make the blood run cold.

Those who witnessed or heard of the accident to the lineman were hasty in jumping to the conclusion that electric lighting was dangerous. Yet it was but natural they should, because ignorance always breeds superstition and fear. The editor of the local paper who published the account of it with the absurd headlines, "Death in the Air," etc., and the twaddle and bosh that followed ought to have known better, but being uninformed regarding electricity he too fell into the general error.

As if errors enough had not been made, the electric light man falls into another. He jumps to the conclusion that the editor wrote a misleading and erroneous article through spite or at the instigation of the gas companies—a charge which, very often, is just as false as that electric lighting is dangerous

The ELECTRICAL REVIEW has all along maintained that the electrical companies should do something to educate the general public, or, at least, that part of it capable of reasoning, because once they understand the nature and characteristics of the current, they will laugh at such cock-and-bull stories as those long current amongst the ignorant. For our own part we have endeavored to popularize the study of electricity, continually printing articles of a rudimentary nature to interest the general reader, and have been rewarded by seeing them republished—though not always credited—in the popular press all over the country.

We have contrasted the effects on the popular mind from the death of a man on an arc circuit and a dozen deaths from gas and on the rail on the same day, and explained the reason why the first spreads alarm and the greater calamities attract no attention. Everyone knows that because a countryman blows out the gas in his bed-room and is found suffocated, that that doesn't mean that gas is a failure as an illuminant. Nor that because an engine falls through a bridge and drags a train after it, that therefore railroad locomotion is perilous. But it is because the general public are ignorant as to electricity that a single and isolated accident creates a general alarm. It is, therefore, not entirely correct to attribute the alarm to the machinations of rivals in the gas business and enemies in the press. Educate the public, electric lighting men! Electric light, like green figs and mangoes, is an acquired taste!

President James Frank Morrison, of the Crescent Club, of Baltimore, was presented on Monday with a ring that cost $3,600. The central stone is an emerald that weighs 6⅝ carats, and is said to be one of the largest and most perfect in this country. It is set between two diamonds that weigh 5 1/16 carats. Mr. Morrison is well known to the electrical fraternity, and is president of the National Electric Light Association. All members of that body will unite with the REVIEW in congratulating him on the very valuable favor he has received from his friends of the Crescent Club.

Mr. Wm. A. Jackson, of Detroit, is looking into the electrical business in New York city and the east.

CHICAGO ELECTRICAL NEWS.

There is hardly any end to the electrical philosophers in this Western country. These learned pundits are scattering their chunks of wisdom and crystals of learning broadcast, and we are all getting hit on the head with the flying nuggets and gems. Here now is one explaining the bursting of a fly-wheel in a rolling-mill in Chicago. The writer, addressing the editor of a daily, says:

"It is not known around the mills how or in what manner this fly-wheel burst. It burst in this way: The fly-wheel, being kept in free and constant motion, not running at the time any machinery, had accumulated such a vast amount of electricity in and about itself that it could stand no more, and the consequences were that it burst into pieces. Any electrician who may read this letter will understand the meaning of what a fly-wheel overcharged by electricity is, and what the consequences are. DAVID CURRAN,
"919 North Ashland avenue."

Now, there is a chance for some statistician to corral some facts relative to the comparative strength of a fly-wheel of huge proportions and an electric light line wire. In the new Westinghouse system an electromotive force of 1,000 volts or so is obtained with ease; but as high an authority as Dr. Otto Moses informed us at Philadelphia that the wire was capable of carrying this current. How unfortunate in this case that this rolling-mill scientist had not notified the rolling-mill people of the danger they were constantly incurring, by allowing the wheel to accumulate such a fearful "charge," when it would have been so easy to have given the wheel just labor enough to work off the excess.

A late incorporation license by the Secretary of State authorizes the organization of the Chicago Electric-Service Company, at Chicago, with a capital stock of $100,000. S. S. Badger, R. W. Day, and Z. S. Holbrook, incorporators. The purpose is to construct and operate devices for the control and regulation of heat, operated by compressed electricity.

There has been so much said *pro* and *con* on the underground conduit franchise in Chicago that more than a mere allusion to the fact of its existence is unnecessary. We all know that such privileges are held by the Chicago Sectional Underground Company, its heirs and assigns, "and so, and so, and so on," and there are persons who are unhappy over the fact of this exclusiveness.

To escape this thraldom certain persons and people have endeavored to obtain a similar or better franchise for still further underrunning our streets and alleys with an extensive system of ducts for wires.

A very formidable array of property holders have signified their feelings in the matter by signing a very strong remonstrance against the passage of an ordinance authorizing an electric-light company to tear up the streets to put in a conduit for its wires. The document sets forth that the signers are informed and believe that several companies already have conduits and operate underground wires, and at least one company has an extensive system of conduits, practically covering the entire business district. A large part of its space is unoccupied, and is sufficient for all probable demands for years to come. Portions of it are successfully used by most of the electric light companies now doing business in the city. So the signers insist that under the circumstances the company now applying should be refused an ordinance. It does not offer to give the city the use of any of its space, nor to allow others to use it; and even if that were not the case, they think the whole city ought not to be annoyed and the pavements be torn up and mutilated, when there is already ample conduit space that can be used.

Among the signers are Charles Counselman, Higgins & Furber, Mead & Coe, W. E. Hale, Home Insurance Company, Central Safety Deposit Company, Samuel A. Crozier, Potter Palmer, Jonathan Clark, Amos Grannis,

Phœnix Insurance Company, N. B. Ream, John D. Parker, George L. Otis, John V. Farwell & Co., Mandel Bros., estate of C. H. McCormick, William D. Kerfoot & Co., L. Z. Leiter, Ogden, Sheldon & Co., estate of H. O. Stone, Isham & Prentice, W. K. Nixon, R. Schloesser.

On the 7th instant Mr. O'Neill, an employe of the company using the Thomson-Houston system on the south side, forgot himself and made a cross contact between a couple of wires, and will probably lose the forefinger, if not the thumb of one hand.

O'Neill is an excellent man, capable and worthy in every respect, but the best man in the business will forget the old proverb about familiarity being the parent of contempt. As Hank Faxon used to render it, "freedery breeds despise."

Professor J. P. Barrett was asked the other day, while talking of the proposed electric lighting of the river courses of Chicago, "What is the greatest practical benefit to be derived from this project?"

"I think this will be the opening wedge to light the business portion of Chicago by electricity. As I figure it, the saving in gas will very nearly equal the running expenses of the electric plant. But there is another and more important problem that the electric lights will solve, and that is the conflict between land travel and the navigation of the river. The swinging bridges at all hours of the day have become unbearable. The vesselmen make the stream as much as possible by day, because it is very dangerous to try to do much in the present darkness. There is no reason why the bridges shall not be closed most of the day and open most of the night. This will cause some kicking on the part of vessel-owners, but they objected vigorously when the city decided to close the bridges at certain hours, morning and evening. If the river is made light as day, all night long, vesselmen can time their trips and the movement of their cargoes so as to accommodate themselves and every one else. It is a practical and beautiful way of lighting the river, and it only remains for the city to furnish the funds."

New York people who have to cross the river in going to and from their homes on the Jersey side can possibly appreciate the annoyance to which our business men are subjected during the season of navigation. While the law compels the closing of the bridge at least once in each ten minutes during the open intervals, there are thousands of hours lost to business men, working girls and laborers, who are compelled to allow for all this delay and waste in their starting down in the morning, getting home at night or keeping an appointment on another side of town, from either direction. Passengers at the tail end of a street car procession are not infrequently "bridged" twice, and sometimes three times, before getting over.

Prof. Barrett deserves the highest meed of praise for his efforts in this line, and should the Council make the appropriation, as it is hoped they will, we shall very soon see a marked difference for the better in the methods of getting to and from the various points in the city. All that will then be necessary to give us all the right to put on more airs than at present, is an elevated railroad and a ditch wide enough, and deep enough, and swift enough to effectually dispose of our sewage.

The happy day is not far distant now.

CHICAGO, March 14, 1887.

The *Tribune*, of this city, opposes the transfer of the control of the subways of this city to the Department of Public Works, and we think its position a most sensible one. The Department is already over-burdened, and the subways should be kept in the hands of those who have brought the undertaking to its present stage. There is much force in what our contemporary says. There has been no taint of partisanship or corruption in what the Commissioners have done, and the progress they have made has apparently given satisfaction both to the companies and to the public.

BOSTON ELECTRICAL NEWS.

Consolidation is the fashion now, and rumor has it that the Weston Electric Light Company, of Boston, is to be consolidated with the Boston Electric Light Company. The success of the consolidation last fall was so great as to assure still greater financial success when there is but one electric light company in the city proper.

The settlement of the differences between the city government and the Police Commission in regard to a police signal system is as far off as at first. Notwithstanding the statements in the daily papers the experimental plant in South Boston has not been interfered with by the fire alarm authorities. In one or two cases extensions of the police system have interfered with the fire alarm to the extent of placing a box on the poles and attaching to the same wires of such thorough insulation that in no event could the fire alarm wires be troubled. As the policy of having the police in Boston under the control of a Board of Commissioners appointed by the Governor has worked so well, it does not seem likely that it will be abolished or that the Legislature will allow its success to be lessened by any hostility on the part of the city government. The Commissioners have applied to the Legislature for increased powers, and for the appropriation of $200,000 for the police signal system. The introduction of this system will render unnecessary any large increase in the force for some time, while without, enough money would have to be expended in salaries for additional officers, to pay for the system in a few years. The success of the plant in South Boston, installed by the Municipal Signal Company, leaves no room for doubt of the eventual extension of the system.

The first electrical railway in New England will soon be started by the East Boston Sugar Refinery. It will run from the water front to the refinery, conveying sugar in bulk. A Sprague motor is furnished with current from an Edison dynamo driven by an Armington & Sims engine.

The contract for removing the engines and boilers from the Brookline Electric Light Company station to the Suburban Electric Light and Power Company station, situated near the Brookline Gas Works, has been awarded to the Jarvis Engineering Company. The Brookline Gas Company have been successfully experimenting with coke for fuel for electric lighting.

The Thomson-Houston Electric Light Company have received an order for a 30 arc light plant for Panama. A 50 horse power Armington & Sims engine, tubular, heater, etc., for this plant will be furnished by the Jarvis Engineering Company. The same company will furnish the Charlestown Gas and Electric Light Company with two additional engines and a second boiler.

When, some three years ago, there was considerable excitement in portions of the United States over the workings of storage batteries, very little was done in Boston, which is therefore a fresh field for their introduction. Experiments are being made at the works of the Brookline Gas Company, with a view to their introduction on the cars of the projected West-end street railway.

INTERESTING LECTURE BY W. J. HAMMER

February 19, 1887, W. J. Hammer, general manager of the Edison Electric Illuminating Company, of Boston, delivered a lecture before the Young Men's Christian Union, on "Electricity and some of the things it will do." After a performance on the electric piano, Mr. Hammer was introduced.

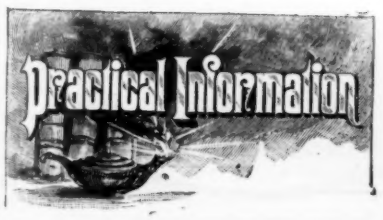
The story is told of a college professor who asked one of his class what electricity was. "I did know," replied the student, "but I have forgotten." "How sad," murmured the professor, "the only man who knew what electricity was has forgotten." The different kinds of electricity, dynamic, thermo, static, frictional, etc., are all the same, appearing under different conditions of pressure or tension. Of the ways of making electricity the simplest is that of chemical action. If a piece of zinc and copper are placed in sulphuric acid and water, when the two metals are joined by a wire, a current is produced. Frictional or static electricity discovered by Thales 2,400 years ago is easily produced by a Holtz machine. The dynamo is really the invention of M. Faraday, who in 1831 discovered that by the revolution of a copper conductor in a magnetic field, or cutting the lines of force, a current was produced. The greatest discovery of the present century is the reversibility of the dynamo; that is, every dynamo, when supplied with a current of electricity, will run as a motor, but not every motor, when set in motion, will act as a dynamo.

A Sprague motor supplied with current from the station, a block away, was now shown driving a dynamo, the current of which was conducted to lamps and to a motor which ran a sewing machine. A large sign with the name Edison: E white, D blue, I orange, S green, O red, N white, was lighted one letter after another in rapid succession. The speaker said that there was an enormously large field for electric motors, and that in time large factories will be replaced by small shops in the home of the workman. There are now run from the Boston station between 40 and 50 Sprague motors of from ¼ to 15 horse power. After experiments with a large Rhumkorff coil colored incandescent lamps in the car of a model balloon were lighted, to show the method of war signaling from captive balloons proposed by Mr. Hammer in 1878. Singing, talking, whistling reproduced by a phonograph driven by a motor received an encore and two calls before the curtain. A Christmas tree lighted by colored lamps was rotated by a motor, the lamps being switched in and out of circuit. Various advertising devices, electric sewing, red and blue dishes of water illuminated by incandescent lamps were shown. A gold fish was caught and allowed to swim around in the dish with the lamp in his stomach. It is true that the digestion of the fish is aided by this; at least they grow fat. To show the harmlessness of the incandescent light, a lamp was broken in a silk handkerchief. After an experiment with a powerful electro magnet, which, at the will of the lecturer, acquired a hunger for a lot of keys, the principle of the electrical piano was explained. To an ordinary piano a third pedal is added, and by pushing this down contact is made, so that when any key is pressed a vibrating armature strikes the corresponding wire, and an organ effect is produced by connecting the wires with brushes and using perforated paper music. Any music may be played on any number of different pianos at any distance. After illuminating a model of the statue of Liberty Enlightening the World, the principle of the motor was explained. The method of obtaining electricity direct from coal was explained, and the lecture closed by a spiritualistic seance. Bells rung, drums beat, noises natural and unnatural were heard, a cabinet revolved and flashed fire, and a row of departed skulls came into view, and varied colored lights flashed from their eyes. The same lecture was repeated March 11, as large numbers of persons could not even find standing room at the first lecture.

BOSTON, Mass., March 15.

The electric light companies in Pawtucket, Woonsocket, Providence, and Newport, R. I., have applied to the State legislature for the right to enter upon the business of manufacturing and supplying gas. The cause for this was the effort on the part of the gas companies to obtain State permission to supply electric lights. This is carrying war into the enemy's country.

A certain learned professor, in the course of a long climb to the summit of a Highland mountain, took the trouble to enlighten the gillie by whom he was accompanied regarding the electric light, the telephone, and other modern inventions. As Donald never condescended to give the slightest indication of either interest or wonder, the professor expressed his surprise at his silence, on which the Highlander confidentially informed his enlightener that he was "a big leer himsel'!"



Queries and Answers.

To the Editor of Electrical Review:

1st. What is electromotive force of ordinary magneto generators used with Bell telephones?

2d. Have you any knowledge of any person ever having been seriously injured by the current from such a generator?

3d. If some of the organs of a person's system were previously deranged, would a shock from a generator of this sort aggravate such derangement or disease?

4th. If a person take in either hand a pole from such current, in which direction would it pass?

5th. How much of the body would it traverse?

6th. What constitutes the conductor, any way—is it the skin of the person, his blood (veins) or muscles, or is he like a piece of metal (of more resistance, of course), the current permeating all the parts?

If you or any of your subscribers will kindly answer the above, you will greatly oblige T. W. M.

ANSWER:

1st. The electromotive force of ordinary magneto generators in the telephone service is approximately 150 volts.

2d. No person could be injured by current from such a generator.

3d. Probably would, if applied directly.

4th. The current would pass in alternate directions, the generator being an alternating generator.

5th. The current would traverse or pervade every portion of the body in proportion to the conductivity of the different portions of the body.

6th. All the constituent parts of the body are (strictly speaking) conductors, but differ in degree.

To the Editor of Electrical Review:

When a dynamo is started how are the magnets charged before any current is generated by the dynamo? Yours,

SIMPLEX.

ANSWER.—The first time a dynamo is run the field magnets are charged by a current from a battery or another dynamo. Cast-iron retains considerable "residual" magnetism a long time after the magnetizing force (either a magnet or a coil of wire carrying current) has been withdrawn. Now when the armature is made to revolve a slight current only is generated, as the field magnets are very weak. This current, though small, makes the field or "electro-magnets" stronger, the current in the armature becomes stronger. From this increase of current the field magnets are made stronger magnets, and the increase continues until the iron can be but little more strongly magnetized by an increase of current.

To the Editor of Electrical Review:

I wish to obtain a current of $\frac{1}{10}$ to $\frac{1}{2}$ volt; how can I obtain so low an electromotive force from a battery? X. Y. Z.

ANSWER.—Connect the zinc of a Clark cell to the zinc of a Daniells cell; the terminals to which you connect your leading wire are the silver pole of the Clark cell and the copper pole of the Daniells cells. The Clark cell has an electromotive force of 1.435 volts, the Daniells of 1.122 volt; 1.435 — 1.122 = .313 volts The current from the first cell will pass through the second, but with diminished electrical pressure. These batteries have been mentioned, as they are very constant. Three Daniells' in opposition to two Clark's would give ½ volt A thermopile would in many cases be more convenient; any desired electromotive force can be obtained by varying the number of elements or the difference of temperature of the junctions.

Telephonic News

*** A great many telephone men are becoming interested in electric lighting. Among these are Messrs. Vail, Madden, Sargent, Hall, Fay, Jackson, and many others.

*** The telephone property known as the United Company has been consolidated with the Missouri and Kansas Telephone Company, the latter company, increasing its capital to $1,250,000. The United Company's territory consisted of nearly all of Kansas, the Indian Territory and a small part of southwestern Missouri.

*** The numerous uses to which phosphor-bronze is adapted is shown by the diversity of standard products in the price list of the Phosphor-Bronze Smelting Company, 512 Arch street, Philadelphia, Pa., for 1887, which run all the way from steel pens to sledge hammers, and include a number of new specialties in addition to the usual stock of bar, plate, sheet and telephone and telegraph wire.

*** The Bell Telephone Company, through its officers and counsel, has filed an important motion in the United States circuit court at Boston regarding the government's suit to break the patent. The company asks leave, in addition to filing a demurrer to the suit, to plead the fact that decisions have already been given in other suits which involved the same questions as those now raised, and that they are now soon to be passed upon by the United States supreme court.

*** M. Janin has discovered that a layer of cellulose on the surface of any fabric will render it waterproof. The mixture is prepared with pyroxyline, which is obtained by disaggregating some cellulose with paper or with rags in a mixture of sulphuric acid and azotic acid. This pulpous mass is put in camphorated alcohol, to which is afterward added a mixture of alcohol and ether. The compound is applied on hard objects with a brush, but stuffs are dipped into a bath of the mixture. M. Janin's mixture is simply celluloid dissolved.

*** The success of the Brussels-Paris Telephone Line seems to have given a great stimulus to the movement in favor of long distance telephone lines in France. It is satisfactory to note that up to the present time our own country, says London *Electrician*, is distinctly in advance of the rest of Europe in this matter. The Northern and Midland districts and the south of Scotland are already well provided with inter-urban lines, and the west of England and South Wales are rapidly advancing in the same direction. In France the question of long distance telephone lines is entirely in the hands of the State, and, owing to an early preference for the Van Rysselberghe system, very little progress has been made. In fact, the line from Paris to Rheims long remained the sole representative of the system. Now, however, several special lines are about to be built the first on the programme being from Paris to Rouen and from Paris to Havre and Troyes. In point of distance the latter line will considerably exceed anything similar to this country. We have always held that the application of the Van Rysselberghe system to long lines, which were built originally for telegraphic purposes, cannot possibly be accomplished without impairing the efficiency of each service. But it is happily true that the converse does not hold, and if at any time it should be worth while to do so, there can be no doubt these special telephone lines may without difficulty be made simultaneously to subserve the purposes of telegraphy. If the telephone had happened to precede the telegraph, the Van Rysselberghe system would have proved simply invaluable.

New Electrical House.

One of the most promising new firms recently incorporated is that of Edison, Gilliland & Co, organized for the purpose of manufacturing and dealing in all kinds of electrical apparatus and instruments. Capital stock, $100,000. Thos. A. Edison, Ezra T. Gilliland, 40 Wall street; Chas. Batchelor, Frank W. Toppan and Jonathan C. Tomlinson, incorporators.

An Electrified City.

Dr. William M. Garrard is in the city today on his way home from Cheyenne, W. T. He was appointed Receiver of Public Moneys at Cheyenne by President Cleveland, from Lawrenceville, Ill., his former home having been at Paris, Ky. Dr. Garrard was forced to return for his health, his indisposition having been caused by an atmospheric phenomenon, which is singular to say the least. He, with many other residents of Cheyenne, have been overcharged with electricity which affected their nervous systems to such an extent as to cause most unpleasant consequences, such as insomnia and hallucination and depression.

The super-electrification, if the term may be used, of the Cheyenneites was caused by the continued blowing of strong winds for a period of seven weeks. The velocity of the wind during this time has never been less than thirty miles and sometimes as great as eighty miles an hour. The ground in consequence became extremely dry, and the friction of the wind in passing over it produced an enormous quantity of electricity, and every one was more or less charged with it. The old residents are used to such things, and are in a sense non-conductors, or are charged with something stronger than lightning, but the effect was serious on the new residents. Dr. Garrard said that when two persons charged with differing quantities of the fluid would shake hands there would always be a distinct shock, and the cats are simply crazy. They are walking electric batteries, and give painful shocks when they are touched.

Dr. Garrard is a genial Kentuckian who does not drink, and he says it is rather hard to have escaped delirium tremens and all the nervous ills that flow from Jersey and Bourbon lightning and catch them from the wind. Such a condition is unheard of in Cheyenne, and many residents have gone to California temporarily to get relief.—*St. Louis Post-Dispatch.*

Telegraph and Cable Lines Bringing, Under Ocean and Over Land, World-Together.

There are now ten submarine cables at work between North America and Europe. The first of these was laid in 1869; the second, in 1873; the third, in 1874; the fourth, in 1875; the fifth, in 1879; the sixth, in 1880; the seventh and eighth, in 1882; and the ninth and tenth, in 1884. Six of these cables start from Valentia (Ireland); two from Brest; and two from Penzance. The last named were laid by the Mackay-Bennett Company, which has also communication with Havre, as well as with Emden in North Germany.

As regards South America, communication is established between that continent and Europe by two cables commencing at Lisbon and terminating at Pernambuco (Brazil). Telegraphic communication between England and India is assured by two cables, leaving Bombay, touching at Aden and Suez, restarting again from Alexandria, and traversing the Mediterranean as far as Marseilles, touching on the way Malta and Bona (Algeria). Another cable, touching at Lisbon and Gibraltar, unites Malta and Falmouth English enterprise has developed the largest extent of submarine telegraph. Great Britain has now communication with France by eight cables laid between Dover and Calais; with Portugal, by a cable touching at Vigo and beached at Lisbon; with Spain, by two cables between Falmouth and Bilbao; with Germany, by four cables laid between Emden and Lowestoft; with Norway, by two cables beached at Arendal and Ekersund; with Sweden, by a cable beached at Gottenburg; with Denmark, by a cable commencing at Newcastle and terminating at Londerwig; with Holland, by two cables laid between London and the Hague; and with Belgium, by a cable from London to Ostend. England—or to speak more correctly, English capitalists—possesses further cables between Tripoli and Malta; between Malta and Sicily; between Alexandria and Otranto, touching at Candia and Zante; between Alexandria and Aleppo, touching at Cyprus; between Alexandria and Port Said, between Suez and Aden, touching at Suakin in the Red Sea; between Suakin and Jedda, across the same sea; and between Madras and Australia, in the Indian Ocean, uniting en route Penang, Singapore, and Java. It was by this latter cable, with the aid of another between Singapore and Saigon, Hue and Haiphong, laid in 1885, that France received intelligence of the war which she waged for some time in Tonquin and Cochin China.

In the China Sea English companies further own cables uniting Saigon, Hongkong, Foochow, and Shanghai, on the one hand, and Haiphong, Hongkong, Amoy, and Shanghai on the other. Two cables which unite Shanghai and Japan (Nangaski) to the Corea and Siberia, are also English property.

Yet again, on the African coast, a cable leaving Cadiz and running to Senegal, touching on the way at the Canary Islands, has been laid by English capital, which has further developed another cable from Aden to the Cape, touching at Zanzibar, Mozambique, and St. Laurent-Marquez. Australia is united to New Zealand by a cable from Sydney to Nelson; France is united to Algeria by three cables laid between Marseilles and Algiers, while another cable, beached at Marseilles and Barcelona, unites France to Spain.

Russia is united with Denmark by a cable between Libra and Copenhagen; with Sweden by three cables between Nystad and Stockholm; and with Constantinople by a cable laid between that city and Odessa. This cable, prolonged across the Sea of Marmora to the Archipelago, will connect Constantinople with Salonica. Austria possesses a cable from Trieste to Corfu and Zante. A small cable between Otranto and Vallonia puts Italy in communication with Turkey. Corsica and Sardinia are united by cables of no great length—first, to France; and secondly, to Italy.

Another cable must be placed to the credit of the English, viz: That uniting Kurrachee in British India with Turkey in Asia. This cable passes down the Persian Gulf and touches at Bushire and Jask.

In the Western world the Antilles are linked with the United States by a cable commencing at Georgetown in British Guiana. Another cable unites Jamaica to Colon in the Isthmus of Panama. On the eastern coast of South America a cable commencing at Para runs to Buenos Ayres, touching at St. Luis, Para, Pernambuco, Bahia, Rio de Janeiro, Santos, Desterro, Rio de Sud, Chry, and Montevideo. On the western coast of South America the principal towns are united by a cable commencing at Tehuantepec in Mexico and terminating at Valparaiso (Chili). In the Gulf of Mexico a cable unites Vera Cruz to Tehuantepec and Galveston. The Caspian Sea has also a cable, which crosses it between Baku and Krasmowodsk. Although this summary of the world's submarine telegraphs is tolerably extensive, it is quite possible that it is still not quite perfect, so vast has been the development of submarine telegraphy.

.... The quarterly report of the Western Union Telegraph Company was submitted March 9th. The net revenues for the quarter will be about $750,000, to which is added the $6,171,810.28 of January, making a total of $6,921,810.28; deducting $143,470 interest on bonds, leaves a balance of $6,778,340.28 There has been a large increase in business and a very large increase in expenditures, occasioned, it is claimed, by the removal of the wires in New York and Brooklyn from the poles The committee recommend that no dividend be declared It was voted, the stockholders consenting, that the stock should be increased $1,200,000 to take up scrip issued last April.

OUR PHILADELPHIA LETTER.

To the Editor of Electrical Review:

Heretofore a Philadelphia letter appears to have been an unknown quantity in the columns of the REVIEW. We do a little electric light work here, and have an occasional plant in existence. Probably Philadelphia modesty (?) has prevented our placing before your readers what we really are doing.

I intended sending you a general description of our various arc and incandescent stations, but will take them up separately hereafter, placing their various methods of running before you, and what they are doing.

In the installation of isolated plants, the Thomson-Houston Company appear to have the upper hand, their sales for the past year being probably treble that of any Philadelphia arc company. They have lately installed and started a 50-light station at Bridgeton, N. J., and are now erecting a 50-light arc plant at Shenandoah, Pa., for street lighting. H. B. Smith Machine Company are the contractors for steam plant, which will be a 60 horse power Armington & Sims engine, 80 horse power steel tubular boiler, pump and heater. They are also erecting a central station at Newark, N. J., for a 200-light plant; Armington & Sims engines will be used. Besides, have contracted with the Atlantic City Company to furnish them with a 50-light dynamo and lamps; have also made the same contract with the Harrisburg Edison Company.

The Brush Company appear to be doing strictly a central station business, the largest in Philadelphia, the United States Company following closely to them. In the northeastern section of the city the Northern Company are doing a good central station business. They are running the Thomson-Houston system; considerable increase in electrical and steam plant is about being added to their station.

The Thomson-Houston Company run a small station at their factory, 1110 Noble street; it is to be largely increased shortly.

The Keystone Electric Light and Power Company (Westinghouse system) are very much cramped for room in their present quarters; they are nearly up to their capacity. For a comparatively new company their sale of isolated plants has been very good.

The Consolidated Company (Sawyer-Man system) have placed a number of isolated plants, notably that at Hood, Bonbright & Co.'s new building and Callaghan's Mill, at Angora, where the dynamos are being driven by an Armington & Sims engine.

The Keystone Company have called a meeting of stockholders for April 6th, to vote for or against increasing their capital stock from $100,000 to $1,000,000, to be divided into shares of $50 each.

Philadelphia should call herself blessed, with an era of better and cheaper lighting before her. The gas works pass into the hands of a department of public works, under the new charter to go into effect April 1st; the Keystone or Westinghouse Company propose increasing; the Edison Company of Philadelphia, with a subscribed capital of $1,000,000, are about to begin operations.

The Wilmington (Del.) Electric Company (Edison system) have their new station in full operation, and have lately ordered two more No. 12 Edison dynamos, and their fourth 100 horse power Armington & Sims engine. This station is remarkably well constructed, plenty of room being taken for an increase, which they anticipate at an early date; the electrical work was erected under the supervision and direction of Mr. W. T, M. Mottram, electrician and superintendent of the station. It has proved to be very successful, no "hitches" of any character occurring, which, under the circumstances, shows very good management; the removal from the old to the new station being made without extinguishing a light.

P. B. Shaw, of Williamsport, Pa., has taken a ten years' lease of the Lancaster, Pa., Edison station, 4,000 lights and four 100

horse power Armington & Sims engines. I predict a very successful business for Mr. Shaw, his extended experience with the Edison Company, and management of the Williamsport station, which he placed on a strong dividend paying basis, will enable him with the improved steam and electrical apparatus at Lancaster to declare for himself a very comfortable dividend.

James S. Humbird, representative of the Edison Company for Pennsylvania and Ohio, together with Frank S. Man, contractor for the erection of Edison central stations, have just completed and started at New Orleans, La., the largest incandescent plant in the South. Work was begun about the middle of December of last year; in a little over 60 days the station was in running condition and ready for continuous work. At present the station has a capacity of 6,000 lamps, eight No. 20 Edison dynamos, and is to be increased to 10,000 light plant at an early date.

The steam plant is made up of four 150 horse power Armington & Sims engines and six 110 horse power steel tubular boilers; feed-water pumps are Worthington make; heater and purifier an 800 horse power Goubert, two large Newark filters are used to clarify the water, Mississippi water being used. Plans for the station were drawn under the direction of Mr. J. H. Vail, general superintendent of Edison Company. H. B. Smith Machine Company, of Philadelphia, contracted for and erected the steam plant complete. Very many difficulties were encountered in the erection of the work, owing to the peculiarity of the soil, engines and dynamos being floated on a heavy concrete substructure 32″ deep by 42′ wide by 60′ long, which was cribbed with cypress and tied together with railroad iron.

The contractors say, "the plant was put there to stay; a failure was predicted and looked for, the failure point is past and the present running is very good, especially when it is considered it is being run on a mud bottom, which is apparently without a bottom." Space prevents a detailed description of the electrical work done at this station; it is only necessary to mention that it was well done, and with all the latest central station improvements, under the direction of Messrs. Doubleday & Andrews. A 2,000 light station is now in course of erection at Birmingham, Ala., under the same contractors. J.

PHILADELPHIA, March 7, 1887.

The Western Union Quarterly Report.

THE STOCK OF THE COMPANY TO BE INCREASED.

The following are the important parts of the report of the Western Union Company for the quarter ending March 31, which was adopted to-day:

The net revenues of the quarter ending March 31 inst., based upon nearly completed returns for January, partial returns for February, and estimating the business for March, will be about		$750,000 00
Add surplus, January 1, as above		6,171,810.28
		$6,921,810.28
From which appropriating for—		
Interest on bonds	$123,470.00	
Sinking funds	20,000 00	143,470.00
Leaves a balance of		$6,778,340.28

There has been a large increase over the corresponding quarter of the previous year in the volume of business, and a handsome increase in gross revenues from the land line service, which was counterbalanced by loss of revenues from cable service and by increased expenses incident to the greater number of messages handled and for extensive reconstructions.

The outlay for extensions, additional wires and for insulated wires, with a view of getting the wires off the poles in New York and Brooklyn, has been very large; and must continue for a time to absorb a large part of the net earnings.

The Committee recommend that no dividend be declared.

At the meeting of directors to-day a resolution was passed that with the consent of the stockholders the stock of the company should be increased by $1 200,000, to take up scrip to that amount issued last April.

The directors appointed a committee to mature a plan for taking up the securities guaranteed by the company, such as the Mutual Union securities, etc., by issuing long-time collateral bonds to bear interest at a rate not exceeding 5 per cent.

A So-called Pneumatic Telephone.

To the Editor of Electrical Review:

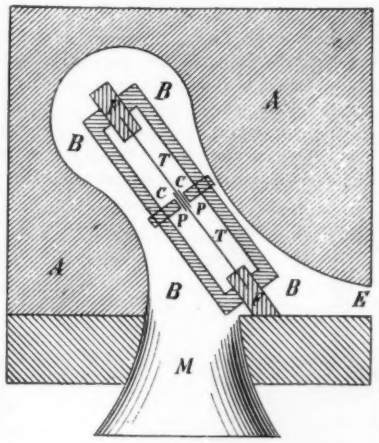
I send you drawing and description of a pneumatic instrument, for which application for patent was filed on the 7th of February, 1887, in which makes and breaks of a circuit are made by air waves produced by speaking into the mouthpiece. This instrument, used with a receiving telephone, gives distinct articulate speech.

W. C. BARNEY.

HOTEL ARNO, 28TH AND B'WAY,
NEW YORK, March 28, 1887.

BARNEY'S PNEUMATIC APPARATUS.

By means of this apparatus, a tympan, *T*, placed as shown in the accompanying drawing, when actuated by air waves produced by speaking into the mouthpiece *M*, vibrates between the two points *P* and *P′*; and when these two points are placed very near to, but not touching the tympan, the said tympan *T* is forced by the air wave, which is compressed in passing between the narrowest part of the air chamber *B* and the tympan, against the point *P′*. The movement of the tympan *T* is arrested by the point *P′*, and then the kinetic energy of the tympan exerts itself to bring it back to its normal position; to this inherent kinetic force is added the force of the rebound of the tympan from its contact with the point *P′*, and the pressure caused by the condensation of the air in its passage through the narrow part of the air chamber on the other side of the tympan, next to point *P′*, united with the other two forces, viz, that of the kinetic energy and that of the rebound, forces the tympan towards the point *P*, on the other side of the tympan, and the tympan passes beyond its normal position of rest (just as does a pendulum moved from its normal positon), and it makes contact on the point *P*. It is evident that the tympan must make contacts alternately on the points *P* and *P′*.



BARNEY'S PNEUMATIC APPARATUS.

Proof of the Contacts.—Let one pole of a battery be connected to the metallic plate *C′*, on the tympan, and the other pole on the point *P′*, having a telephone receiver placed in the circuit; break the circuit at the battery, and if no sound is heard in the telephone, it is evident that the circuit is open between the point *P′* and the tympan. Then speak into the mouthpiece *M*, and sound will be heard, thus proving that the tympan makes contact on the point *P′*.

Let the tympan come to its normal position of rest, remove the battery connection from the point *P′*, and put it on the point *P*, break the circuit at the battery, and if there be no sound in the telephone receiver, it is evident that the circuit is open between *P* and the tympan.

It is understood that the points *P* and *P′* shall be fixed as close as possible to, but not touching the tympan.

Then speak into the mouthpiece *M*, and a sound will be heard in the telephone receiver, thus proving that the tympan, although forced at first by the air waves further away from the point *P*, yet the kinetic energy, the rebound and the force of the air waves acting on the other side of the tympan forces it back against the point *P*.

In this manner it is proved that the tympan in its vibrations between the two points *P* and *P′* makes contact on each of these successively.

New Electrolytic Treatment of Copper Ores Containing Lead and Silver.

Mr. Eugene Marchese, an Italian engineer, has lately introduced and described, in the *Revue Universelle*, an improved method of separating, by electrolysis, the copper from lead and silver compounds or mattes, by using anodes of the metallic sulphides prepared from the substance to be treated. The decomposition of the iron sulphides of the anodes, in their transformation into ferric sulphates, adds the electromotive force generated by this oxidation to that already developed by the dynamo or battery used. The improvement consists in maintaining a continual circulation of the solution obtained by lixiviation of the roasted ores between the anodes and the lixiviating vats, whereby the electrolyte continually absorbs new metal.

The following is a description of the process: The ores containing the copper and the argentiferous galena are generally accompanied with gangue matter, more or less soluble in acids. In this case, the mass is melted in the crude state without any previous roasting. This operation produces a species of matte in which are concentrated the copper, lead, silver, iron, and sulphur contained in the ore, the metals being present in the state of sulphides. An average sample is then taken and the exact contents in iron and copper are determined. This done, one portion of the charge is cast directly into slabs to be used for the anodes, and the remainder of the charge is granulated and then roasted. The proportion of the cast slabs to the whole remainder of the roasted charge is so arranged that they contain in weight of iron two equivalents of this metal for every three equivalents of copper contained in the matte to be roasted; or, in other words, that the slabs shall contain six parts by weight of iron for every ten parts by weight of copper contained in the remainder of the charge. The object of the roasting is to oxidize the copper salts, which are then treated with dilute sulphuric acid, furnishing a solution of sulphate of copper with some sulphate of iron. This solution serves as the electrolyte. The special novelty of this process consists in the attacking of these anodes by the electrolyte, the iron being corroded by the copper solution. This action generates an electromotive force, which, added to that supplied by the dynamo or other generator, permits the use of a much feebler machine than would be required if the solution of cupreous sulphate had to be decomposed between electrodes that would not be attacked by the bath. In casting the plates for the anodes, a copper wire is suspended in the molds, so that connection of each plate is easily made with the circuit wire. The anodes are set vertically to the number of 15 or 20 in appropriate vats; they rest on cross slats, fixed from 6 to 8 inches above the bottom. Between each anode is placed a copper plate acting as cathode.

The sulphuric acid required would in general practice be obtained in the ordinary manner from the sulphurous gases generated in roasting the ores.

One main condition of this process is the continual circulation of the electrolyte between the electrolyzing and the lixiviating vats. When the electric current is turned on, the copper of the anode is deposited on the cathode, while the iron attacked is changed to sulphate of iron. The electromotive force developed by these reactions is utilized in the decomposition of the sulphate of copper in the liquid and its deposition on the cathodes. As the liquor loses its copper salt, it is repassed over the roasted ore, again taking up the copper from the latter, to be again deprived of it by the cathodes. In this manner practically the whole copper is extracted.

The precipitates that form at the bottom of the vats contain free sulphur, oxides and sulphides of iron, lead, and silver, also occasionally a small percentage of copper oxides In cases where these latter are still present in such an excess as to interfere with the subsequent smelting of the silver lead, these precipitates should again be roasted and lixiviated in conjunction with a new charge.

TELEGRAPHIC

.... There are a great many rumors of telegraph consolidation growing out of the proposed sale of the controlling interests in the Baltimore & Ohio Railroad. Even should this result in a consolidation of the Western Union and B & O. companies, there would still be several telegraph companies to compete for the business, so a radical increase of rates need not be feared just yet.

.... One of the most extensive and remarkable works of the engineers of ancient Rome is the Cloaca Maxima, well known as the great common sewer of that city. It is of Etruscan architecture, and still serving its original purpose, is as firm as when its foundations were laid. It was built at least 2,400 years ago, and is one of the few monuments of Rome whose antiquity has never been assailed.

.... Under the slow action of the sulphurous acid thrown in the air of cities by burning coal and the frequent changes in the atmospheric humidity, it is found that the peroxide of red lead, used in coloring certain placards, is sulphated. At the same time the protoxide of lead thus liberated is changed to a sulphite, and this salt, being easily analyzed, it is belived that a means is thus obtained for determining the condition of the atmosphere in large cities.—*Stationary Engineer.*

.... As a sign of the times in the educational world, it may be mentioned that arrangements are being made for starting an electrical engineering class in connection with the Baxter Chair of Engineering and Mechanics in the University of Edinburgh. The class, which is to be conducted under the superintendence of Professor Armstrong, by his assistant, Mr A. C. Elliott, B.Sc., is to be engaged in studying the practical applications of electricity to lighting, locomotion, transmission of power, and telegraphy.

.... The Brooklyn Commission in February last opened bids for fire alarm boxes as follows: Gamewell Company, for iron street boxes (police patrol system), $150 each; station house equipment, $250 each. Pearce & Jones, iron street boxes, $115 each; station house equipment, $250 each. These bids were rejected and re-advertised for, and resulted as follows: Gamewell, iron boxes, $100 each; station house equipment, $250 each. Pearce & Jones, iron boxes, $96; station house equipment, $175. The award will be made this week, unless the commission decide to re-advertise, to see if they can get another reduction.

....The editor of the *Railway Engineer* has been writing a long funny article, in which he advocates the abolition of seats in railway cars, proposing as a substitute the placing of perpendicular bars for the passengers to hang on to. By this arrangement about twice as many persons can be packed in a car as at present. The article argues in a humorous way that passengers, through long training, would rather stand than sit, and it goes on to say that things have come to such a pass that the unfortunate and oppressed railroad companies really must be allowed to earn a dividend or two.

.... In an English discussion of railway speeds it appears that rigid tests with a Bristol and Exeter engine, with 9-foot single driving wheels, gave 80 miles an hour as the greatest attainable rate down an incline of 1 in 90 with no load, a single car reducing this to 78 miles. A Great Western engine, with 8-foot wheels, could do no better than 78 miles down 1 in 100. On a level or ascending grade the maximum can be but little more than 60 miles an hour. As these engines were designed especially for giving the greatest possible speed, it is affirmed that no modern motors are adapted for beating their records, and that reports of train-running at more than 75 miles an hour, even for the shortest distances, must be due to inaccurate timing or other errors.

ELECTRICAL AND SCIENTIFIC

* *Jacksonville, Fla., intends to adopt electricity as a motive power for the Pine street railway.

* * The genuine attar of roses, which is made in India and Australia, costs $100 an ounce at the places of distillation. It takes 50,000 roses to make an ounce of attar.

* * An excellent lubricant that will not corrode brass, and will last for weeks, is made of one part of melted india-rubber (not vulcanized) and two parts of common vaseline.

* * A telegraph wire is now being brought out in England in which the steel is made to cover, surround the copper. The wire is said to be drawn from compound metal, consisting of a hollow ingot of steel filled with copper.

* * At Par, Cornwall, a process, described as the "extraction of iron from China stone by means of electricity," has been for some time under experiment by the St Austel Mining Company, and plant is now being laid down for the permanent application of the process upon a commercial scale.

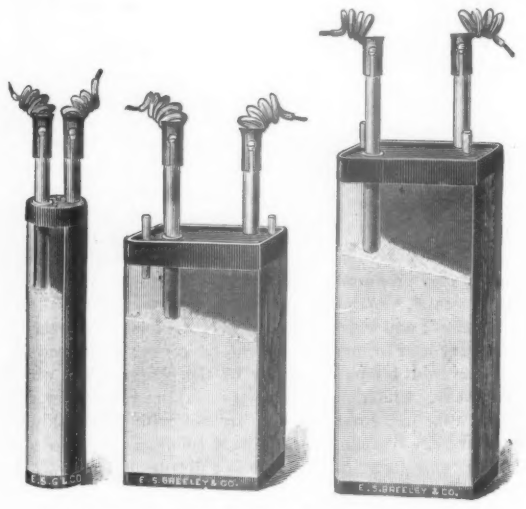
* * Dr. Eisenmann, of Berlin, has found that an acid solution capable (when used in a zinc battery) of being regenerated by mere exposure to the air, may be obtained by forming a solution of 30 gr. of tungstate of soda and 5 gr. of phosphate of soda, dissolved in 350 gr. of water, with the addition of a small quantity of sulphuric acid. The phosphate is added merely to increase the solubility of the tungstate.

* * Three English engineers have been engaged to superintend the construction of three powerful propelling engines for vessels now in course of construction, of the enormous force of 12,000, 20,000 and 25,000 horse power respectively, to be sent to Italy. The Italian government is employing the best engineering and naval skill to be had in Europe, for naval and military purposes, in order that it might fight efficiently should it be disturbed by invaders.

**An editorial—Electric Lighting and Gas Interests—in the New York *Tribune* says: "I have received from Col. William A. Stedman, manager of the Newport Gas Works, to whom I alluded recently as a prominent convert among gas engineers to the theory of the economical union of gas and electric light plant, a circular announcing that he has become treasurer of the American Electric Manufacturing Company, of No. 146 Broadway. He says he has taken this step after careful investigation of the merits of the American system, and with full recognition of electric lighting as a desirable adjunct to gas. 'The furnishing of electric light has become a well established and fairly profitable and permanent industry,' he says, and adds that 'it needs no argument to prove to gas managers that if the electric-business is a paying one in the hands of independent corporations, it must be doubly so when conducted by the already established and trained staff of a gas company. The simplification of electric apparatus, the improvements in construction and reduction in cost during the past few years are factors insuring to the business of electric lighting the element of stability and increasingly rapid development, as well as enlarged application. We all try to increase our day consumption of gas to enable us to utilize our gas plants to a fuller extent. In the furnishing of electric power, there is a promise of growing and profitable employment of electric plants during the day as well as night, and I cordially commend to gas managers careful consideration of the possibilities in this direction, and the consequent profits arising from this branch of business.' I know of no more curious and interesting development of this new industry, and the financial results of the ventures of those gas companies which unite with the American Electric Company cannot but be watched with interest and confidence, too, when such skilled engineers as Colonel Stedman indorse it."

A New form of Primary Battery.

There are three forms of a new and particularly convenient battery shown in the illustration on this page. It is manufactured by the electrical house of E. S. Greeley & Co., of this city, and is of small and compact form, very desirable for medical, testing and numerous other purposes, where intense currents without much volume are required. Owing to the peculiar size and construction of the battery it can be readily put away in a drawer or box, and as each electrode is fitted with a sliding connection which can easily be removed, the batteries can readily be coupled in any series desired. In the forms shown, the largest (No. 6) glass jar is of rectangular shape, the outside measurement is $1\frac{1}{4}\times2\times4\frac{3}{4}$ inches; the next size (No. 7) measures $1\frac{1}{4}\times2\times3\frac{1}{8}$ inches; the third size (No. 8) is mounted in cylindrical form $\frac{7}{8}$ inch in diameter and 4 inches in height. In all cases, the elements and connections extend about two inches above the jar. These batteries can be furnished at a very low figure, owing to simplicity of construction. A pair of the smaller ones are often carried in the vest pocket and used for testing purposes.



GREELEY & CO.'S NEW FORM OF BATTERY.

The Union Storage Battery.

A new battery is being shown by the Union Electrical Power and Light Company, of 127, Cannon street, London. It is an accumulator having plates of spongy lead and peroxide of lead respectively, and differs from previous batteries of the same type in the feature that the peroxide stands alone without the support of any backing, core, or grating. This plate can also be prepared and kept perfectly dry until it is needed, so that spare elements may be held in readiness, and those which are spent be removed from the cells and be sent to the dynamo to be recharged. By this arrangement the labor of renewing batteries, which are not in connection with a dynamo machine, is greatly reduced. The cells, as made at present, contain thirteen plates, and measure 11 inches by 6 inches by 7 inches deep The weight is 20 pounds, and the storage capacity 115 ampere hours. The electromotive force is over two volts on open circuit, and at the company's offices there are to be seen 20 cells feeding 15 glow lamps of 10 candle-power, and 15 cells feeding 12 lamps of similar power. It is claimed that an increase of over 50 per cent. in the relative amount of work to weight is obtained over other lead batteries, while the following table is also put for h as a basis of comparison with primary batteries. The Union battery gives 5 ampere hours per pound of weight:

Holmes-Burke	1.86
Daniell	1.5
Fuller (medium size)	1.02
Leclanché (medium size)	1.0

The company observes considerable reticence as to the method of producing the peroxide plate. It appears, however, to consist of the lithanode which was mentioned by its inventor, Mr. D. G. Fitzgerald, at the last meeting of the British Association, and extolled by him as the coming material for batteries, although he declined to give any clue as to its nature, and confined his remarks entirely to its merits, a proceeding which naturally created a feeling of resentment in a scientific gathering It is formed of a mixture of litharge and 5 per cent. of inert matter, such as earthenware, ground pumice, or kieselguhr. To this is added a salt formed of ammonia and an acid, which when set free by the decomposition of the salt will combine with the oxide the lead, and form an insoluble or nearly insoluble compound with that metal; such salts are the sulphate, phosphate, chromate, tartrate, and oxalate of ammonia. The mixture is placed in a mould, and is subject to a jet of steam carrying a little glycerine with it. This hardens the surface, and at the same time dissolves the salt and brings about the reaction. When this is complete the plate is put away to dry, and is then "formed" by the current in the usual way. The porous lead plate is similarly prepared, but its conductivity is increased by longitudinal strips of pure lead. Both plates are fixed in frames of celluloid, which prevent contact in the cells. The company states that it is calculated the lamps that are exhibited are maintained at one-sixteenth of a penny per lamp hour; we should like to know how the calculation is made, for it is certain that lamps driven direct from a dynamo cannot be maintained at this rate, and the intervention of a battery will not decrease the cost. We understand that the Union cells are giving great satisfaction at the Post-office, says *Engineering;* and there is certainly a wide field for a battery which can be easily renewed, and does not produce sulphate of zinc.

Electrical Transmission by Hot Air.

M. Blondlot has communicated a paper to the French Academy of Sciences for the transmission of electricity of low tension by means of hot air. *Engineering* states that in 1853 M. Edmond Becquerel found that heated gases allowed electricity to pass even when only one battery was the source. M. Blondlot has verified this result. The discharge took place in an inverted bell-shaped chamber heated by a Perrot furnace. Platinum electrodes 3 centimeters in diameter, were used and properly insulated. It is after red heat is reached that the current commences to pass. The current of hot air from an incandescent body allows the current of a single cell to pass. M. Blondlot finds the current to pass, even though the electromotive force is $\frac{1}{1000}$ volt. He also finds that the resistance of the heated air is not a true resistance of the kind found in solid and liquid conductors, but depends on the electromotive force and the intensity of the current. M. Blondlot thinks it probable that the current is transmitted by convection, a term used by Faraday to signify the transport of electricity by particles of air charging themselves on the electrodes, and discharging again. Convection, he thinks, may be impossible because of the adherence of the air and platinum, but possible when this adhesion is destroyed by heat.

Electricity and Insurance.

Under the above title, Mr. Henry Hine read a paper on the 3rd instant before the Electric Club of New York. Speaking of the recent fires, one at the Temple Theatre in Philadelphia, and the other at the Rhode Island Electric Light Company's station at Providence, the author refutes the statement that the fire at the latter place was caused by electricity, it having been distinctly traced to gas; but as regards the former disaster, he fully admits that the electric light was to blame, and that electric light circuits, if badly arranged, will always be a great source of risk. On the other hand, he maintains that, with first-class material and good workmanship, there is hardly any danger from the electric light, an opinion which is also held by English insurance companies, who make no extra charge on buildings and other property, provided the electric light has been installed in accordance with the Phœnix rules. Nothing approaching in completeness or efficiency to these rules exists at the present time in America, although several companies have framed certain rules, and in this connection Mr. Hine says: "Most, if not all, of the various sets of rules now in force, are based on those of the New York Board of Fire Underwriters. It is significant that these rules, the first to be made, and since only slightly modified, have been so closely adhered to, and proved so efficient. I attribute this largely to the fact that they possess the great merit of being short and few in number. Is it not a mistake to try and cover every detail of construction by those rules? Insist on the primary requirements for safety, but leave details for those engaged in the business, who must be responsible for the proper operation of plants. Possibly, our insurance friends are not aware that, in every plant installed, precautions are adopted not required by any rule save the necessity of making it practical and efficient in operation, and the enforcement of a complication of detail rules would often prevent the adoption of the safest method, as it would be absolutely impossible to provide for all cases." This is a common sense view, and likely to prove beneficial. When speaking of the question of size of wire, the author severely criticises the many unscientific rules now in force; such, for instance, that the main conductor must equal in weight per foot the wire constituting the circuit of the armature of the dynamo, or that all connections must have a conductivity at least equal to No. 6 wire, American gauge, and he would prefer to substitute a rule according to which the sectional area of the wire would be proportional to the current. In making this proposition, the author only substitutes one bad rule for another, since it has been shown by Professor Forbes and others that the carrying capacity of a wire, as limited by a rise of temperature, is not proportional to the area, but is proportional to the diameter, thickness of insulation, position, and other circumstances. Mr. Hine suggests that an insulation test should not be the same for high and low potential circuits, and that a fair test would be to stipulate that the insulation resistance of the whole circuit should be inversely proportional to the total length of wire employed. He is also strongly in favor of prohibiting all joints which are not soldered. As regards the installation of street circuits and their entrance into buildings, he considers the case sufficiently covered by the New York rules, an opinion justified by the few fires and accidents which have occurred in connection with these circuits. After laying stress upon the necessity of a well organized system of inspection, and the employment of intelligent inspectors, rather than a very minute elaboration of rules for every detail, the author concludes his paper by an appeal to the fire insurance companies to encourage the introduction of the electric light, by offering reduced rates where it is used, and suggests that both insurance and electric light companies should draw up a set of rules in the spirit indicated.—*Industries* (*London*).

The Fort Wayne Jenny people have just sold the McKeesport, Pa., Electric Light Company a sixty arc plant.

OUR KANSAS CITY LETTER.

The purchase of the property of the United Telephone Company, for the sum of $210,769, payable in the capital stock of the Missouri and Kansas Telephone Company, was completed very harmoniously. There were represented at the stockholders' meeting 8,866 shares of Missouri and Kansas stock out of 10,000 shares. Those not sending in their proxies no doubt failing to do so from pure carelessness, not on account of any unwillingness to do so.

The telephone exchanges at Wichita and Arkansas City are growing very rapidly, and the telephone exchanges generally are adding many new subscribers.

At Kansas City there are now 1,800 subscribers and applications for 60 new sets of instruments that cannot be furnished until an additional switchboard is received, an order for which was made on the Western Electric Company last November, but which they are unable to fill before April 1st. Another order has been placed for the eleventh switchboard to be furnished July 1st, and there is no doubt but that the company will be ready for it before that time.

Mr. Jno. Ebert has been appointed manager of the Kansas City exchange, and is filling the position in a manner perfectly satisfactory to the company as well as pleasing subscribers.

St. Joseph, Mo., is waking up, and they now have a real estate boom; and parties are leaving Kansas City to speculate in St. Joseph property. The telephone company has 525 subscribers there, and orders for more. It is intended by the company to put in the multiple switchboard at this point soon.

Topeka is also growing very rapidly, and the company is arranging for 200 new subscribers this year. This will necessitate considerable construction work for the coming season.

Two hundred miles of toll lines will be constructed out of Kansas City this spring.

The Missouri Legislature have set the 16th for adjournment. They have introduced three rate bills effecting telephone companies and two underground bills, but none of them have become laws. The Committees on Corporations in both Houses, to whom the bills have been referred, are, fortunately, for the electric companies as well as the public at large, composed of the very best material to be found in the State; and they have shown themselves desirous of doing justice to all concerned. After hearing both sides of the rate question in the committee meetings, with the exception of one vote, the committees were unanimous in reporting adversely on the bills.

The Kansas City Electric Railway, that has been in the process of construction for some time, is not yet in operation, and it seems doubtful about its being completed and in working order at a very early date.

The Kansas City Electric Light Company is about to establish a plant for the furnishing of incandescent lights up town, and has arranged to put up a building just back of the *Journal* office. I think they are to use the Thomson-Houston (Sawyer-Man) incandescent system.

The *Times* Company have an excellent Edison incandescent system, and have recently placed an additional dynamo, and are arranging to furnish lights to a few of their neighbors. It is expected that the telephone exchange room will be lighted from this plant.

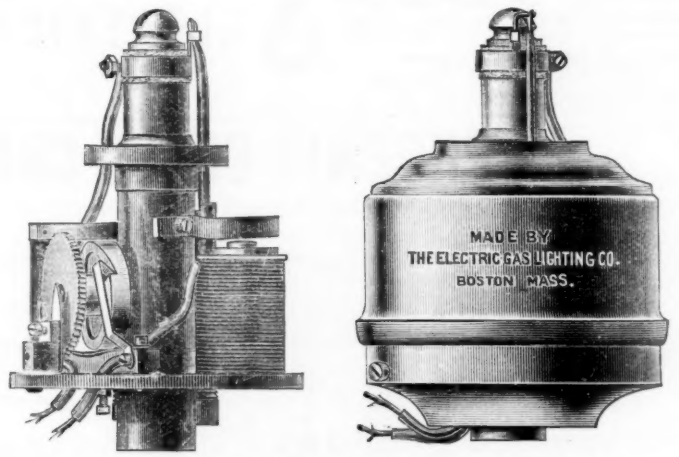
Referring to the spring boom in real estate that has struck a majority of Kansas towns, a good story is told of an Eastern capitalist who went to Newton, Kas., to buy some city lots. An enterprising real estate agent showed him some cheap, but very desirable property near the city limits, and the capitalist took the matter under advisement for a few days. The next day he went to Wichita to see if he could do any better than at Newton, and an enterprising real estate agent of Wichita showed him some very desirable lots near the city limits of Wichita, which the capitalist recognized as the same lots showed him by the Newton real estate agent the previous day; but the price had advanced 50 per cent. The capitalist did not purchase the lots, for fear he would be required to pay taxes in both cities.

D. A. L.

Kansas City, March 12, 1887.

Improvements in Electric Gas Lighting.

The Electric Gas Lighting Company, on January 1st last, moved into new and convenient quarters at 35 Arch street, Boston, to accommodate their increasing business. Some time ago the company purchased a large amount of machinery and entered upon the manufacturing of their patented gas lighting apparatus, bells, annunciators, keys, switches, besides keeping in stock for the general trade burglar alarm, telegraph, telephone and electric light supplies.



ELECTRIC GAS LIGHTING APPARATUS.

After costly experiments, the methods of igniting gas by electricity have been revolutionized by the new style automatic single magnet burner. All annoyances attending the use of the old style burners is entirely overcome by this ingenious piece of mechanism. Its simplicty and efficiency under all conditions and freedom from liability to accident have made it a favorite among the trade. The company's factory is supplied with the most improved machinery and is the best equipped of its kind in the city, and only the best skilled workmen are employed. Every part of the burners is made in the factory and hundreds were seen in the various stages of manufacture. The armatures are stamps from the best wrought iron before annealing. All screws are made by special screw machinery. The different parts made to exact gauge, are next taken to the assembling room, and when put together the burner is adjusted. On pressing one push-button the gas is turned on, ignited, and the circuit broken; by the other the gas is shut off. If desired the light may be turned up or down by varying the length of pressure on the push-button. The valve has no springs and will not stick or leak. The action being positive, no amount of jarring can turn the gas on or off. The working parts are well protected from dust, and the size is as small as is consistent with perfect operation.

——A number of enterprising electric light men from the West have been in New York recently, getting points on the business. Among these were E. R. Weeks, Paul W. Bassart and Wash. Adams of Kansas City, J. A. Corby, of St. Joseph, C. C. Warren, of Chicago, J. H. Woolsy, of St. Paul.

—— The Nelson building, Kansas City, Mo., one of the large new structures recently erected in that city, is to be lighted with nearly 1,000 incandescent lamps of the United States Electric Lighting Company.

Induction System in Boston.

The starting of the first induction system plant in Boston marks the beginning of a new era in electric lighting. The cost of copper conductors necessary when lights are installed a long distance from the generating station have in multiple arc systems been a great obstacle in the extension of incandescent lighting. It is true that many lamps have been run on arc light circuits, but the waste of power when portions of the lamps are turned off, the necessity for having a certain definite number of lights attached to one box, and the care required for the cut-outs, distributors and other devices necessary have prevented the introduction of the multiple arc system to any considerable extent. The system invented by Mr. Slattery comprises an alternate current machine with the usual station voltmeters and ammeters, and converters placed in or near the building where the lamps are to be used. The converters are ring shaped, the external diameter being 15 inches, the internal diameter being 7 inches; the core is of insulated fine wire; over this is wound the thick wire for the lamp circuit. Over this is wound the fine wire for the primary circuit. The dynamo at the Ferdinand street station of the Brush Electric Lighting Company has two armatures, each containing 24 coils. There is no iron in the armature, the whole being held firmly in place by a double brass ring. There are 48 poles to the field magnets. The pulley is 12 inches diameter, making 1250 turns per minute, and driven by a 9 inch single belt. The cores of the field magnets are 4½ inches in diameter outside the wire, and 7 inches long. The current has 250 alternations per second, electromotive force is 1,000 volts mean electromotive force. The exciter is a Kimball & Davis 30 light dynamo, making 2,500 revolutions per minute, and adjustable resistance in the circuit of this dynamo and the field of the alternate current machine giving control over the current. One of the converters at the station attached to sixteen 45-volt lamps was so wired that lamps could be turned off rapidly. No change in candle power could be noticed. The converters are therefore self-regulating. In the primary circuit there are two fusible wires in glass tubes. If the secondary circuit be short circuited, enough current flows through the primary to fuse these wires and cut the coil out of circuit. The first installation was in the offices of the New York and Boston Dispatch Company, No. 40 Summer street. As the wires run, the distance from the station is 1¾ miles. A No. 6 Stubb's gauge wire, with a capacity for a larger number of lamps than the 63 lamps at present in use. Three conventers are used, each in an iron case, and the whole placed in a wooden box placed outside of the building. In this way 45 volts is the highest potential in the building, and the terminals may be touched without any unpleasant sensation. In Mr. Slattery's system, which is the property of the Sun Electric Company of Woburn, Mass., the converters are placed in multiple arc.

G.

Boston, Mass., March 15.

ELECTRIC LIGHT NEWS

—— The price of gas in Philadelphia has been reduced to $1.50 per thousand.

—— The Florence Gas and Electric Light Company has been organized at Florence, Ala. with Z. P. Morrison as president; Andrew Brown, vice-president, and R. L. Bliss, secretary and treasurer.

—— The Electric Light Company, of Brooklyn, proposes to give the city twenty free lamps in lieu of reducing the price on the present electric lamps in use, and to help the city out in the matter of its lack of funds for the lighting department.

—— The Brush Electric Company, of Rochester, N. Y., is having fifteen double turbine water wheels put in for its new station, which will be finished in about six weeks. The turbines are furnished by the Wemple Sons Company, of Fultonville, N. Y.

—— Mr. F. G. Waterhouse, formerly of San Francisco, has accepted the position of general manager of the Waterhouse Electric Company of Hartford, Conn., of which system his brother is the inventor. This company has a large plant in operation in the upper part of New York which is being enlarged.

—— The Boston and Albany Railway Company is lighting its cars by means of the Julien storage battery. A test of the battery was made which resulted so satisfactorily that arrangements have been made, we are informed, for using the batteries generally throughout the system for the purpose of lighting.

—— At no time have as many new manufacturing enterprises been projected as at this time; they cover almost every branch of manufacturing. Electric light enterprises are springing up by the score. Material for water works and gas-works, and pipe material of all kinds is in very active demand.—*Chicago Journal of Commerce.*

—— The Edison Electric Illuminating Company, of Brooklyn, was incorporated at Albany recently, to manufacture, use and sell electricity and electrical and mechanical apparatus in Brooklyn for producing light and power. The capital is $500,000, divided into $100 shares, and the trustees are as follows: Eugene Crowell, Spencer Trask, Chas. E. Crowell, William D. Sargent, George W. Nash, Charles F. Bound, Edward H. Johnson, Charles E. Chinnock, John C. Tomlinson, Wm. H. Richardson and Sigmund Bergman.

—— In the Circuit Court of the city of Richmond, Va., last week a charter was granted to M. B. Leonard, C. E. Wellford, H. T. Wickham, Benj. B. Weisiger, and T. L. Chapman. The name of the company is the Old Dominion Electric Light and Power Company. The objects for which it is formed are: To acquire by purchase, lease, or otherwise, all property, real or personal, which may be necessary for the proper business of said company; to supply electric lights for public or private use in the State of Virginia; to supply power by electricity, and to make such applications of electricity to commercial and industrial uses in the State of Virginia as may be found advantageous and desirable. The amount of the capital stock is to be not less than $5,000 nor more than $100,000, divided into shares of $100 each, and the real estate to be held by the company is not to exceed five acres. Richmond, Va., is to be the place where the general business of the company is to be transacted, and the location of the principa- office. The following are the names of officers for the first year to manage the affairs of the company: President, M. B. Leonard; secretary and treasurer, C. E. Wellford; directors, M. B. Leonard, C. E. Wellford-H. T. Wickham, T. L. Chapman, and B. B. Weisiger.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 8, 1887.

358,682 Electric motor: Malcom W. Long, Harrisburgh, Pa.

358,691 Automatic electric fluid regulator; Ransom C. Page and Francis H. Soden, Chicago, Ill., said Page assignor to Susan O. Page, Ravenswood, Ill.

358,753 Method of and apparatus for synchronizing and regulating the movements of motors; J. Harris Rogers, Bladensburg, Md.

358,775 Electrical apparatus for operating valves in mains; Fred. B. Graves, Rochester, N. Y., assignor to the Electric Fire Apparatus Company, same place.

358,778 Duct conduit for electrical conductors; Geo. D. Holt and Wm. T. McGinty, Minneapolis, Minn., said McGinty assignor to said Holt.

358,793 Induction coil; Marmaduke M. M. Slattery, Woburn.

358,812 Telephone; Warren D. House, Kansas City, Mo., assignor, by mesne assignments, to the House Improved Telephone Company, Philadelphia, Pa.

358,854 Self-signaling and self-recording electro-magnetic thermoscope; Henry I. Haight, New York, N. Y.

358,864 Fire alarm; Frank G. Lyon, Jersey City, N. J.

358,866 Automatic valve for regulating fluid pressure; Albert P. Massey, Watertown, N. Y., assignor to the Eames Vacuum Brake Company, same place.

358,890 Telegraphy; Charles Selden, Baltimore, Md., assignor to himself, William T. Barnard, same place, and Francois Van Rysselberghe, Brussels, Belgium.

358,910 Electric bell; Edward A. Wildt, Long Island City, N. Y.

358,939 Telephone and telegraph; Noyes F. Palmer, Jamaica, N. Y.

358,940 Telephone; 358,941, Telephone transmitter; Noyes F. Palmer, Jamaica, N. Y.

358,975 Electric bolt releasing device; George L. Henzel, San Francisco, Cal.

359,040 Electric railway signal; Charles D. Tisdale, Boston, Mass., assignor to Joseph Benson, same place.

359,050 Electric railway; Edward M. Bentley, Brooklyn, N. Y.

359,051 Annunciator; Aaron D. Blodgett, Boston, Mass.

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ASSIGNEE'S SALE.

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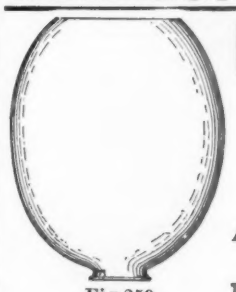
Fig.259

PHOENIX GLASS COMPANY,
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Fig.255
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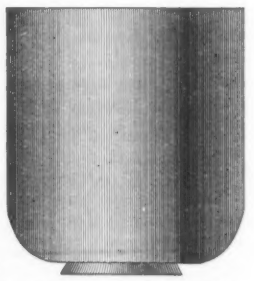
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